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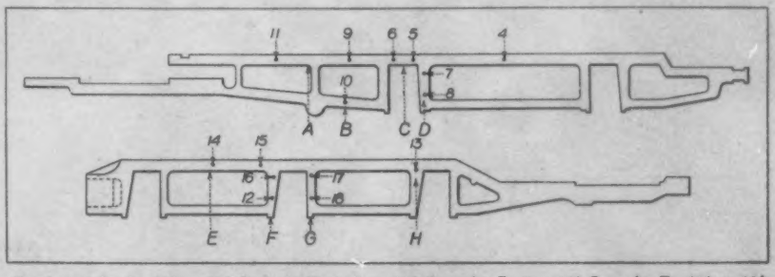
Steel Cast Locomotive Frames

The Importance of the Heat Treatment They Get—High Carbon, Vanadium and Nickel Castings Considered

BY EDWIN F. CONE

The manufacture of steel cast locomotive engine frames in the United States has assumed proportions that are realized by very few people. Twenty years ago nearly all the locomotives were supplied with engine frames forged from wrought iron and the prejudice against those made of steel castings was very decided. Today it is probable that at least 95 per cent. of the locomotives made by the two large producing companies, the American Locomotive Company and the Baldwin Locomotive Works, are supplied with steel cast frames and at least 80 per cent. of these are produced in what is known as the Chester, Pa., district, where there are seven large steel foundries, a large part of the output of which consists of locomotive engine frames of all sizes, weighing from 1000 to over 10,000 lb. each.

The early prejudice against steel cast frames was due largely to the comparatively poor product made in the early stages as compared with that made now. Steel foundry practice has been developed to such an extent that locomotive frames are now produced which equal or excel any forged frame ever made, not only in endurance in service, but in physical and chemical qualities also. There have been improvements in methods of molding, in the quality of the metal and more especially in the heat treatment of such frames. Briefly, the general practice is to mold the frames from a pattern of wood in a long flask, using the usual foundry sand mixtures. The molds are then thoroughly dried in suitable ovens and after being fitted up are supplied with metal from acid open-hearth furnaces of about 25 tons capacity, some foundries in the Chester district pouring as many as eight to ten frames per day. The method of molding and pouring varies in each foundry, as also, in particular, the method of heading and gating. And the producer of frames who is the most successful is the one that has the best methods of pouring and molding and the best metal.



Sections: At A, 4½ x 4½ In.; At B, 3¾ x 4½ In.; At C, 6 x 4½ In.; At D, 4½ x 4½ In.; At E, 4½ x 6½ In.; At F, 4¾ x 4½ In.; At G, 4¾ x 4½ In.; At H, 4½ x 6¼ In.

FIG. 1—FRAMES FOR LOCOMOTIVES CAST OF STEEL

The chemical and physical properties of these frames are about the same, no matter by what foundry produced. With the exception of one foundry in the Chester district, they all use acid open-hearth steel. The average chemical composition of all ordinary carbon engine frames is as follows: Carbon, 0.25 to 0.30; manganese, 0.65 to 0.70; silicon, 0.25 to 0.30; sulphur, 0.030 to 0.040; phosphorus, 0.025 to 0.035.

By ordinary carbon is meant all frames as distinguished from high carbon, such as 0.38 to 0.42 per cent. carbon, and also vanadium steel cast frames. Of late there has been some demand for a higher carbon frame whose composition is the same as that mentioned above except that the carbon content is 0.38 to 0.42 per cent., with a relatively higher tensile strength running from 80,000 to 90,000 lb. per sq. in., with a correspondingly lower ductility. Whether this is an advantage or not over the lower carbon frame is a matter of some dispute. It would seem that it would be more liable to breakage from shock than the more ductile and milder steel, but a test in service should determine this point in due time, one railroad in particular in the East having a large number of engines equipped with these high-carbon frames.

Those advocating the use of 0.40 per cent. carbon frames claim that the extra strength is needed because of the heavier weight resulting from larger boilers and upper structure, and that the deleterious effect of shock can be overcome by suitable springs. There is a fact in this connection, however, that must not be overlooked, i.e., that all high carbon steel castings have a tendency to be more or less "blowy," no matter what precautions are taken in producing the metal. High carbon metal is wilder and more active when tapped than the ordinary lower carbon, and there are many who insist that this is an element of weakness in the frames, which, combined with a greater tendency to brittleness, renders them less desirable. The harder frames seem to be growing in favor, however, the demand for them increasing every year. The relative physical properties of these two kinds of frames are here tabulated:

Properties of Two Classes of Locomotive Frames

	0.25 to 0.30 Carbon	0.38 to 0.42 Carbon
Tensile strength, lb. per sq. in.	65,000 to 75,000	80,000 to 90,000
Elastic limit, lb. per sq. in.	34,000 to 39,000	41,000 to 47,000
Elongation in 2 in. per cent.	25 to 35	15 to 20
Reduction of area, per cent.	40 to 55	25 to 35
Elastic limit of tensile strength, per cent.	52	53

It is claimed by some that a special heat treatment of the high-carbon steel renders it superior to any other steel for frames.

Many foundries are now also called upon to furnish vanadium steel locomotive frames, and many of the roads are putting them to a careful test and scrutiny. The effect of the vanadium is to raise the tensile strength for the same carbon content by 10 to 15 per cent., and to increase the elastic limit also, with a corresponding decrease in elongation. The average of some 400 tests on engine frames made of annealed vanadium steel with an average vanadium

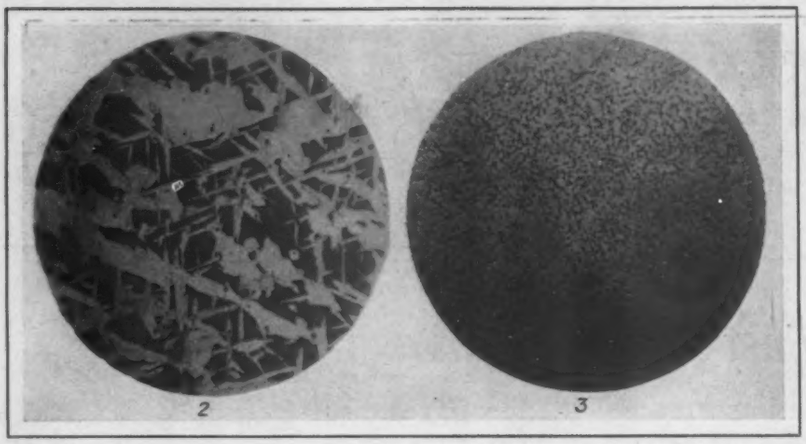


Fig. 2—Original Microstructure of the Ordinary Carbon Frames. Fig. 3—The Microstructure Obtained by Quick Cooling

content of 0.18 to 0.20 per cent. showed the following results:

Average of 400 Tests of Annealed Vanadium Steel Cast Engine Frames

Tensile strength, lb. per sq. in.	78,014
Elastic limit, lb. per sq. in.	46,842
Elongation in 2 in., per cent	22.26
Reduction of area, per cent	35.89
Elastic limit of tensile strength, per cent	60.03

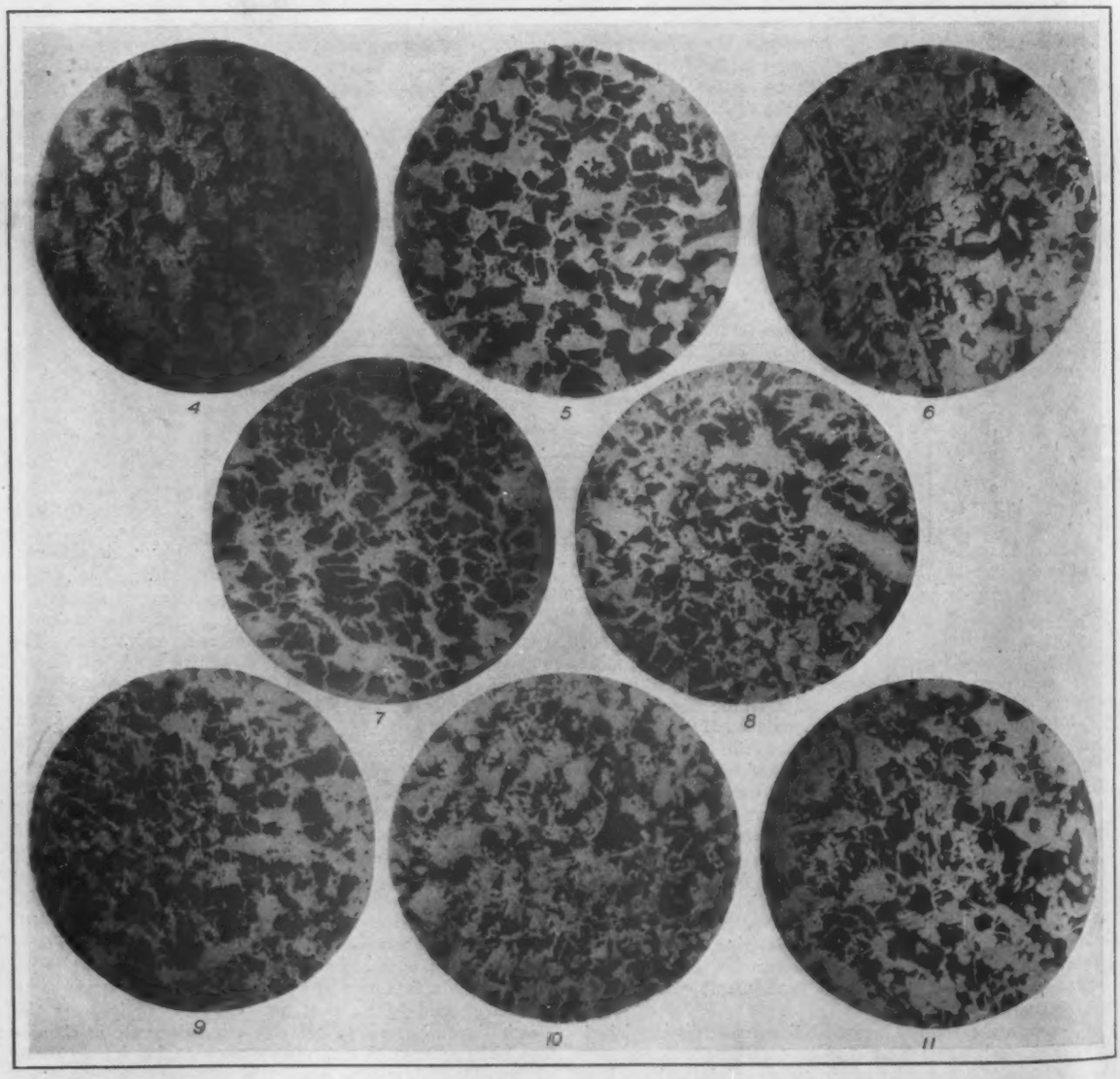
But unless the vanadium steel is properly heat treated, it is a more dangerous steel than the corresponding low-carbon steel frames, having a tendency to be much more brittle when under-annealed or unannealed than the ordinary, and this also holds true of 0.40 per cent. carbon steel. And it is an open question whether special heat treatment of vanadium steel cast frames is not necessary to produce the best and most reliable results. No attempts have been made to use nickel steel cast frames, though the physical properties of nickel steel castings are very superior, having average results about as here given.

Physical Properties of Nickel Steel Castings

Tensile strength, lb. per sq. in.	85,000 to 95,000
Elastic limit, lb. per sq. in.	51,000 to 57,000
Elongation in 2 in., per cent	20 to 28
Reduction of area, per cent	35 to 40
Elastic limit of tensile strength, per cent	60

Ordinary careful annealing brings the results without any trouble. Another advantage is the fact that the nickel content of scrap nickel steel is recoverable in the furnace enhancing the value over any other scrap frames.

But no matter what kind of steel is incorporated into engine frames, their annealing or heat treatment is of vital importance. The general practice is, or should be, to place



Figs. 4 to 11—Microstructure of Bottoms Located at Correspondingly Numbered Points in the Upper Frame of Fig. 1.

them in a large pit annealer where they are heated by gas coal, gas or oil, to above the recalescence point, and after being held there a sufficient length of time to penetrate the frame thoroughly from end to end, to complete the transformation of crystalline structure, they are allowed to cool slowly in the closed annealer. While still hot, but at a black heat, they are removed and straightened under a steam hammer or a drop. The best form of annealer is one fired from the entire side and not from the ends, thereby insuring an even heat treatment throughout the frame instead of the ends being heated possibly too high and the centers not enough.

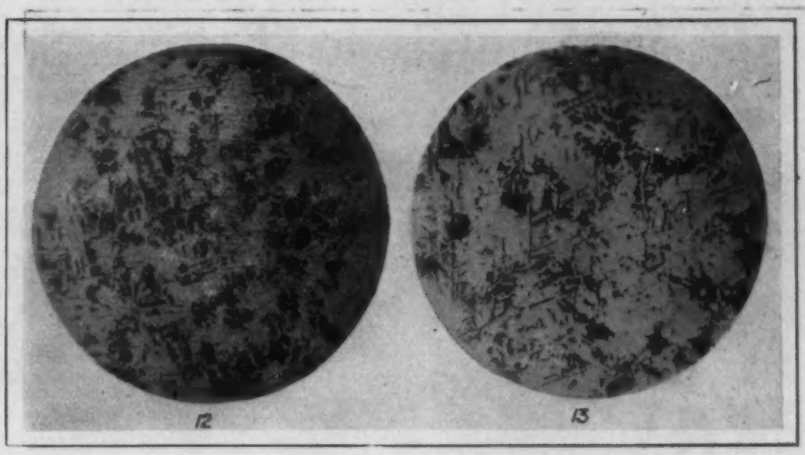
There has always been some question as to how thoroughly an engine frame is annealed. The usual method of judging the annealing is from the fracture of a 3 x 1¼ x 8-in. test bar, cast solid on the frame. If this shows the proper fine structure to the eye it is usually accepted by a railroad inspector regardless of the heaviness of the section of the frame. It is manifest that this does not necessarily determine whether the inside portions have been heated above the recalescence point and relieved of all strains.

At the suggestion of one of the large locomotive companies two frames of different sections and weight were especially cast and annealed by the usual practice. Each frame was then cut up and slabs of 1 in. thickness were cut out. From the center of each slab buttons were prepared for microscopic examination to determine whether the center of each frame was annealed. The drawings on page 1009 show frames with the location of the sections of which the photomicrographs were made. Fig. 2 shows the original microstructure of all ordinary carbon frames before annealing, revealing the large pearlite and ferrite crystals, the breaking up of which is so important to relieve the frame of all internal strains. Figs. 4, 5, 6, 7, 8, 9, 10 and 11 represent photomicrographs taken from the centers of the corresponding points in this frame, and show a complete breaking up of the original structure and a thorough annealing throughout the frame—the microstructure one would expect from slow cooling. This shows not only what it is possible to do in annealing frames properly in a suitable annealing furnace but also what ought to be done.

There has been some discussion as to whether the microstructure represented by the photographs is the best or whether that represented by Fig. 3 is more desirable. The latter is considered to be ideal steel microstructure, but it can only be obtained by quick cooling from above the recalescence point. It is therefore an open question whether bringing frames out into the air to obtain this microstructure would not set up unequal strains in such castings of varied thickness of metal and therefore be harmful. Of course, it is recognized that such heat treatment would render the physical results superior to those obtained by the method of slow cooling, but it is probable this advantage would be offset by other disadvantages. At present the almost universal method is the slow-cooling heat treatment.

In the case of the lower frame represented in Fig. 1, which frame is the larger, the buttons taken from the center do not reveal as much as in the case of the other frame. Photomicrographs of points at 12 and 13, Figs. 12 and 13, are characteristic of them all. They are dominated by large ferrite crystals. It is probable that a complete change has taken place, though in large sections of steel castings it is difficult to determine this because of segregation. Large cross sections of these frames polished and then etched in acids reveal a marked freedom from porosity in any part.

In addition to the microscopic tests, there was cut from each frame an 8-in. section of the rail. From this physical tests were made of the drag and cope sides as well as one from the center for comparative results.



Figs. 12 and 13—Microstructure of Bottons Located at Correspondingly Numbered Points in the Lower Frame of Fig. 1.

Physical Tests to Substantiate the Microscopic Tests

Lighter or upper frame represented in Fig. 1.

Analysis

Carbon	0.28
Manganese	0.66
Silicon	0.285
Sulphur	0.044
Phosphorus	0.039

	Drag	Center	Cope
Tensile strength, lb. per sq. in.	76,000	73,500	77,000
Elastic limit, lb. per sq. in.	42,000	39,000	41,500
Elongation in 2 in., per cent.	26	19	23
Reduction of area, per cent.	38.8	24.1	43.1
Fracture	Silky ½ Cup	Silky	Silky ½ Cup

Heavier or lower frame represented in Fig. 1.

Analysis

Carbon	0.24
Manganese	0.66
Silicon	0.271
Sulphur	0.044
Phosphorus	0.039

	Drag	Center	Cope
Tensile strength, lb. per sq. in.	66,000	62,700	65,800
Elastic limit, lb. per sq. in.	36,000	34,000	34,700
Elongation in 2 in., per cent.	33	15	33
Reduction of area, per cent.	53.3	32.2	52.5
Fracture	Silky	Silky	Silky

The superiority of the drag and cope tests is manifest and is easily explained because, at the center of any steel casting, there is a lessening of the density of the steel owing to shrinkage.

From this study of the subject it is evident that if a locomotive steel cast frame of average cross-section is heated above the recalescence point and held there a sufficient length of time that the frame has been completely annealed and relieved of all strains. In foundries where most of the locomotive frames are made this is the practice and if adhered to strictly an excellent product is sure to be the result.

Data Sheets of New Departure Ball Bearings

The New Departure Mfg. Company, Bristol, Conn., has brought out a series of most elaborate data sheets devoted exclusively to the adaptability of these bearings to machine tools. The data sheets cover the single and double row combined radial and thrust, the cup and cone and the magneto types of bearings. These sheets are printed in convenient letter size and are punched for binding in a loose-leaf binder. Technical data of specific mountings in milling machine heads, speed cone and driving pulleys of drilling machines, air compressor bases, high-speed grinding spindles and grinding or polishing heads, etc., are given. This information is especially complete, including dimensions in both inches and millimeters for the bore, diameter and width of various sizes of bearings, the number and diameter of balls used per row, various other dimensions and the load which can be carried at a speed of 600 r.p.m. Tables of standard fits for radial or annular ball bearings are also given.

The Riehlé Brothers Testing Machine Company, 1424 North Ninth street, Philadelphia, Pa., has just finished building what is claimed to be the largest screw power testing machine in the world, namely, 1,000,000 lb. on two screws, which it is shipping to the American Steel Foundries, Alliance, Ohio.

Gas Analysis in Testing Steam Boilers*

How Numerous Determinations of the Conditions of Combustion and Quick and Complete Power Plant Tests are Made

BY ALBERT A. CARY

The value of obtaining correct analyses of the furnace gases, including the proper sampling methods, cannot be overestimated. Earlier in this article I have spoken of the lack of care or intelligence so frequently exhibited in obtaining gas analyses. Inexperience and lack of equipment will probably account for many of these unreliable results. I can recall my early attempts, first with a rubber aspirating bulb with which I attempted to draw gases from any easily accessible position through a collecting bottle, which method was crude and productive of very poor samples.

Securing Samples of Gas for Analysis

Then came collecting over water in vessels which were filled at the start and the water allowed to leak out through a bottom opening, thus drawing the gas in the top of this vessel by this method of aspiration. I thought that I was collecting good average samples by this method, by allowing the water to escape slowly through a fixed small opening during the entire time of the test, until I woke up to the fact that a greater quantity of water escaped during the first part of the test, due to the great flow head, than escaped toward the end, when there was but a small depth of water left in the tank. This caused a rapid collection of gases at the start and a very slow collection at the end of the test, thus not giving a correct average.

I overcame this trouble by syphoning the water out of the vessel, which resulted in a constant flow during the entire time; but in using these large quantities of water, considerable absorption of some of the gases took place, which difficulty was largely overcome by thoroughly saturating the water with the gas before starting. Then followed the aspiration of the gas in comparatively large quantities, by use of a steam aspirator, which practice has given me the most reliable results.

Taking Both Flue and Furnace Gas Samples

The term "flue gas analysis" is commonly used for samples collected generally. I make a distinctive difference in the two terms, "furnace gas analysis," which gives me the conditions of combustion in the furnace and its immediate combustion chamber, in distinction to the "flue gas analysis," which is principally useful to show the amount of air infiltration through the setting. In most of my work, I collect simultaneous samples from both the furnace and a position within the setting, just back of the flue outlet.

These samples are withdrawn in a constant continuous stream by means of the suction apparatus, and they are passed through a special piece of apparatus I designed for this purpose, called a gas collector, from which fresh gas samples of exactly the same composition as exists within the setting at the moment they are required for analysis are made easily available.

The slow and uncertain methods by which gas samples are so often collected, seldom give (through their analysis) the exact quantity of the gases existing at the instant their entry is timed on the log sheet. This exact information, at times, proves very valuable and instructive when it is desired to trace the peculiar happenings at some critical time of observations.

The necessity of keeping constantly informed as

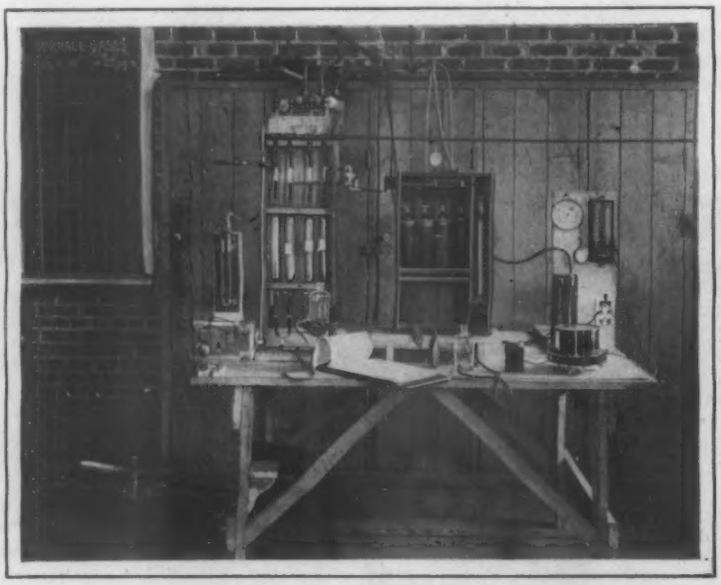


Fig. 8—Chemist's Table for Making Gas Analyses During a Boiler Test

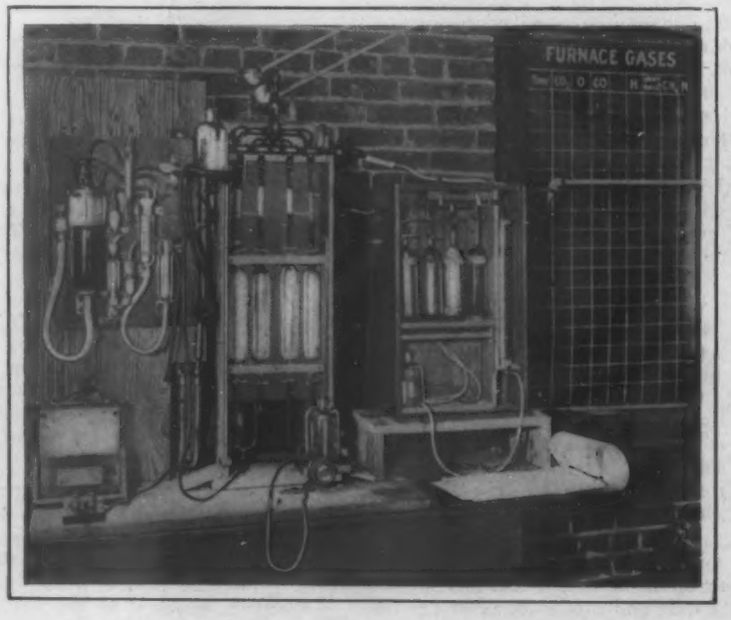


Fig. 9—Apparatus for Duplicate and Extended Gas Analyses

*Continuation of the article by Mr. Cary in *The Iron Age* of October 17 to which was given the title "Refined Apparatus for Boiler Testing." The present contribution is to be followed in the next issue, if possible, with the analysis of a boiler test employing refined apparatus and methods.

to the conditions existing inside the furnace during the course of the test requires very frequent analyses and in many tests these analyses are made so infrequently that they are of very little value in interpreting the test or in showing what the true furnace conditions are during the time the test is being conducted.

Manipulating the Gas Collecting Apparatus

In order to overcome the various troubles, I experienced in previous test work, I finally built up the equipment shown in Fig 8 for testing boiler furnaces. This view shows my chemist's table, and he is kept constantly busy here during the entire time of the test. The arrangement shown is constructed for testing two boilers, the rear ends of which are located just to the left of the table. The tall apparatus near the left end of the table is the gas collector, which has four gas collecting tubes in position. The samples of gas in this case are drawn from each of the two furnaces as well as from the flue outlets and all four samples are conducted to this collector by piping.

Each gas sample passes through its individual filter, filled with glass wool (which filters may be seen over the top of the apparatus) and then these samples drop down through glass tubes, behind the case (not visible in the cut) and near the bottom, the gases turn upward and pass through the gas collecting tubes; then continuing their flow upward into the top cross pipe, which it will be seen, is continued to the right, passing outside of a window. A steam ejector is placed on the outer end of this pipe, and it constantly draws the gases by its suction effect through the lines of gas piping and through the gas collecting tubes just described.

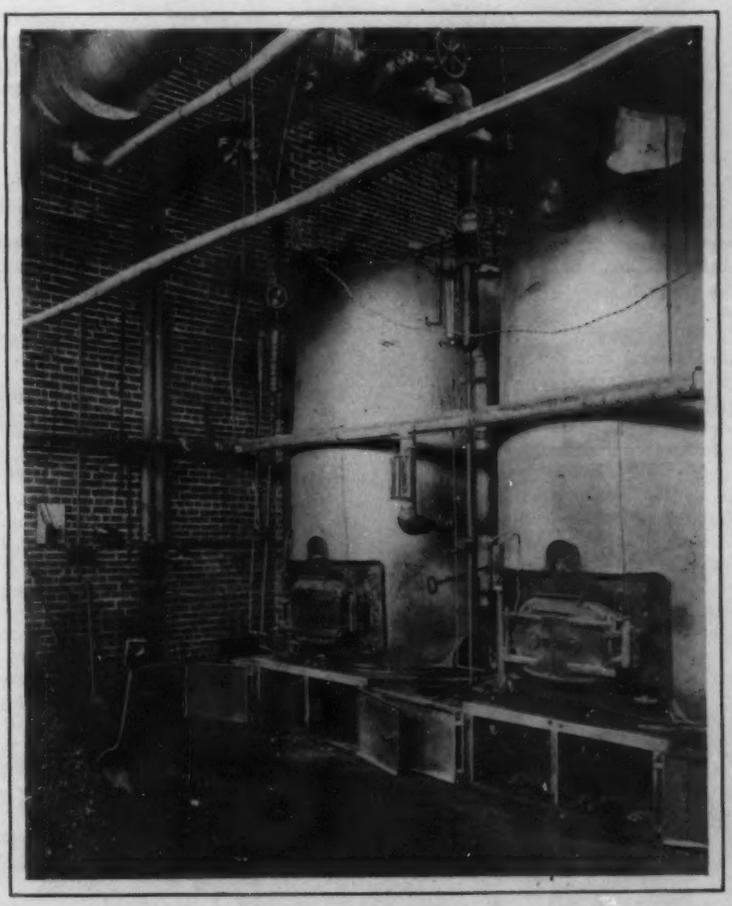


Fig. 10—Locking Switch on Wall at Left for Keeping Account of Coal Consumption, and Wired Fire Doors for Learning When Doors Are Open

The U gauge seen at the left of the gas collector is constantly watched to see that a constant suction is being maintained all through the test. At the moment the sample is required, a stop cock just below the cross suction pipe and a second cock, at the bottom of one of the gas collecting tubes, are both closed. Immediately afterward the two corresponding stop cocks of the adjoining tube are closed, and thus we have imprisoned two samples of gas (about 300 c.c.), one taken from the furnace and one from the flue outlet of the same boiler.

Either of these samples may be transferred over to the gas analyzer (which is located at the right of the gas collector) through the T-shaped tubes, located just below the upper stop cock. This is accomplished by opening one of the stop cocks between the collector and gas analyzer and lifting the leveling bottle, which is seen at the right side near the bottom of the collector,—which leveling bottle has a water connection into the bottom of the U-shaped passage followed by the gas, between its positions of entrance and discharge into and out of the collector.

As this leveling bottle rests upon a small platform, which is easily raised by the hand, the platform and bottle are raised together, stopping (by a detent device) at any hight desired, which position is just below its final level. The little wheel in front of this platform (seen immediately in front of the bottle) is then turned and lifts the platform very gradually to an exact position indicated by a scale. The measuring burette of the analyzer will then be charged with exactly 100 c.c. of gas under atmospheric pressure. Sufficient gas is retained in the collector tube to furnish a duplicate sample should it be required, but, when the analysis of this sample is found to be satisfactory the water in the collector tube is quickly discharged, the stop cocks reopened and a moment later the gas is running through again. It will be seen that speed in manipulation without sacrificing accuracy was the object for which this apparatus was designed.

The Fast Operating Gas Analyzer

Turning now to the gas analyzer, which is of somewhat novel design, I must give credit to Prof. R. C. Carpenter for suggesting to me the general construction of this apparatus, which I have modified slightly after considerable use. My first gas analyzing experience was with the Orsat apparatus and I have also used other gas analyzers, but they all proved too slow. In short, I might say that the apparatus here presented includes the best features of several other more or less standard machines with their weak points eliminated and I have checked its accuracy carefully by analyzing duplicate samples in it and in my apparatus for exact determinations over mercury, and found both to check very closely.

The pipettes are made up of two glass cylinders, each closed at one end, the smaller cylinder being inverted and placed within the larger vessel and held in position by a large perforated rubber cork (similar to a ring). The smaller inside cylinder has a tube leading from its closed end to the top cross supply pipe, made of capillary glass tubing and having a stop cock, or rubber tube with a pinch cock inserted in the vertical line.

In the first pipette, which holds the caustic solution, is a roll of fine iron wire gauze, wrapped up like a clock spring. This is placed in the interior of the smaller or inside vessel, and when the gas sample is introduced, the solution has its surface depressed, and the liquid rises in the outer vessel. Thus a very large surface of gauze, holding the viscous solution on its two surfaces, is presented to the gas and, in consequence, a very rapid absorption takes place. The speed with which this action occurs is easily seen, by the dropping of the liquid in the outer vessel and its rising in the interior chamber. By watching this speed, the strength of the solution is easily noted. Prof. Dennis has experimented with iron wire gauze placed in the CO_2 absorption pipette, as I have also, and with its thick coating of adhering caustic solution, no undesirable effect can be observed on the quality of the gas sample.

The use of pyrogallol for the absorption of oxygen proved too slow for me and I use stick phosphorus in the second pipette, which presents a very large surface to the gases and acts very quickly in absorbing the oxygen, besides not suffering deterioration. Care must be taken to prevent its temperature from dropping too low, and with this precaution it will be found a highly satisfactory reagent.

The third and fourth pipettes contain the usual cuprous chloride solution, which is exasperatingly slow in its action, but by using copper gauze in these pipettes, similar to the iron gauze in the caustic pipette, much quicker action is obtained and the presence of this copper constantly recuperates the solution.

The usual practice of my chemist to overcome the trouble of the slower absorption of the CO, is to pass one sample of gas through the successive pipettes, finally leaving it in the third pipette. Then a second sample is started through, which is finally left in the fourth pipette. He then returns to his third pipette and determines the CO of the first sample.

When greater speed is required, he successfully runs three samples at a time through this analyzer. He has succeeded in getting a complete analysis, with perfect absorptions in 5 min. and this would mean 12 analyses per hour, but ordinarily 8 analyses per hour are obtained when required. Fresh solutions are very quickly substituted for the old in this apparatus, and the rapidity of each following absorption (which can be seen), as well as testing by returning the gas samples occasionally to the same pipette, keeps him constantly informed as to the working condition of the apparatus.

Use of a Duplicate Analyzing Equipment

The equipment I have shown and described here is only one of a number of combinations I have used. Sometimes this collector is arranged to produce two duplicate samples from a single furnace and flue, and then it discharges each pair of samples from the opposite sides of the apparatus. One pair of samples goes to the analyzer just described, while the second pair is led to other gas analyzing apparatus, as shown in Fig. 9. In this case a very rapid CO_2 apparatus is used, where the quality of gases runs very uniform and double the number of analyses are made that can be made in the other apparatus and with no more effort.

When any material change takes place in the precentage of CO_2 found the duplicate sample, collected at the same instant on the other side of the collector, is sent through the regular analyzer and analyses are conducted there until a uniform run of the same quality of gas occurs again. I have used this duplicate sample arrangement of the collector for the determination of other constituents in the furnace gases, which could not be determined with the apparatus just described in use.

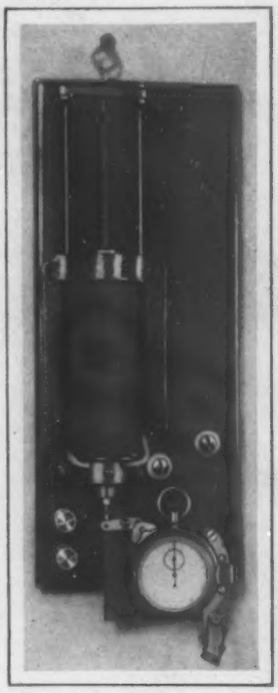


Fig. 11—Open Door Time Recorder

By use of my large gas collector, I have succeeded in obtaining 20 gas samples in 20 min., which allowed me to follow the different changes occuring in the furnace in this time. This proved especially useful when making the analysis of the working of a gas producer, starting with the time when it was blown by air and then followed by blowing with steam. I have also constructed a larger portable gas analyzer on the same principle as the one illustrated here, with which I can obtain a complete analysis of a gas in not over 25 min. A few tests of boiler furnaces with this complete apparatus have shown me that there is considerably more to be learned in the operation of such furnaces through the use of such a complete analyzing apparatus, which has been used more for gas producer tests.

There are a few matters of additional interest to be found in a further inspection of the chemist's table, shown in Fig. 8. At the left of the table and hanging against the wall will be seen a black-board which allows the chemist to place the results of his gas analyses there as rapidly as they are obtained. As this record is easily seen from my observation table, I am kept constantly informed as to the condition of the furnace, which information, connected with the other automatically recorded results I have always before me, keeps me thoroughly posted as to just what is happening in all parts under test at all times.

Automatic Notifications of Open Fire Doors

At the left of the gas collector and under the U-gauge will be seen an electric bell and buzzer placed side by side. These are connected to a small electric commutator, or partially insulated brass ring which is attached to each furnace door, and moving with the door as it is opened or closed. This will be seen in Fig. 10, where it is placed over the right top hinge of each door, the right side of the double door overlapping the left side at its center, thus requiring opening before the left half can be opened. Pressing against this ring is a brass spring (or brush) which is arranged to bear upon the insulated portion of the ring when the door is closed. As soon as the door is opened, the ring revolves around its center, bringing its metallic face against the flat brass spring.

The electric connecting wires are shown in Fig. 10, and the instant the door is opened the electric circuit is completed and this rings the bell or buzzer shown on the chemist's table according to the door which happens to be opened, the bell ringing for the No. 1 boiler and the buzzer for the No. 2. Thus the chemist is immediately notified, and should the analysis be made when the door is opened, note is made of this fact on the log. As this open furnace door analysis does not indicate the normal condition of the furnace, there is no danger of confusing the reading with those taken which show the true furnace conditions.

Recording Peroids of Time When Doors are Open

I use this electric furnace door connection for still another purpose by the use of the instrument shown in Fig. 11 and an electric counter. Fig. 11 shows my open door recorder, which is the combination of an electric solenoid and a continuous stop watch and one of my most recent inventions. When the circuit is closed, by opening the door, the core of the solenoid is drawn down, striking the starting mechanism of the watch. As soon as the door is closed the flow of the current through the solenoid ceases and the spring attached to the top of the core instantly lifts the core up and the watch stops recording.

A second opening of the door starts the watch again, which goes on recording the time, continuing from the time last recorded. Thus, at the end of the test (as well as during the short periods when readings are taken) I have the total number of seconds of door openings. By turning to my electric counter, which is operated on the same circuit, I have the total number of times the door is opened during the test. I always time the intervals of door opening when the fires are cleaned by another stop watch as well as recording the number of door openings during this operation.

By deducting these last described times and openings, I have the efficiency of the fireman well recorded, and by taking these times of openings in connection with the gas analysis, I am frequently able to discover many things of interest. This apparatus is very useful in tests comparing hand fired furnaces with continuous machine-stoking methods.

It may surprise some to know that this apparatus has shown that it is no uncommon occurrence, with a good fireman, doing good stoking, to find the furnace doors of a boiler open for 10 per cent. of the entire time. This means that in a 10-hr. run the furnace doors are open for a full solid hour.

On the right-hand side of the chemist's table will be seen a small collection of other apparatus, including a barometer, hygrometer and a millivolt meter, connected

through a double pole switch to thermoelectric couples placed at the rear ends of the combustion chambers of each of the two furnaces under test. Thus the chemist has these furnace temperatures under observation in connection with his gas analyzing investigation.

There will also be seen a second U-tube, which is connected with the flue outlet, back of the damper. This gives an indication of whether the boiler is being operated with an open or closed damper.

Combined Boiler and Engine or Turbine Tests

The great adaptability of the apparatus described in connection with steam consumption tests of engines and turbines becomes apparent after a short consideration. The specially equipped automatic water weigher is used to determine the quantity of water fed to a boiler (or boilers) delivering all the steam to the engine or turbine under test, and again it is sometimes used to determine the condensed steam coming from the engine or turbine through a surface condenser. With the proper corrections applied, the exact amount of steam used can be determined over very short intervals of time, thus making the record shown on the chart almost equivalent to a record obtainable by use of a continuous indicator which delivers a continuous succession of indicator cards.

When testing reciprocating (including pumping) engines I have a number of steam engine indicators, one of which I place at each end of each of the cylinders. As all of these indicators are equipped with electrical attachments, which bring all pencils up to the card at the same instant by the mere pressing of an electric button, I can closely watch the condition of the load as shown on the chart of the water weigher, and can thus obtain cards under rare conditions during the course of the test which would otherwise likely be lost. By placing an indicator push button near the water weigher and a second one in the engine room, I can operate the indicators from either position.

Further, I place an electric counter, showing the number of dumps of the water weigher, on the observation table near the engine thus constantly having this record right before me, and a convenient stop watch gives me the intervals between discharges when this information is desired.

By use of a tachometer, the speed of the engine is taken and noted on each card, and in important tests I have the cards worked up by use of a planimeter as rapidly as they are taken from the indicators. By plotting the indicated horse-power, a comparison between the results obtained by the indicator and the water chart automatically plotted by the water weigher often leads to valuable information.

When the push button is pressed to take indicator cards, in tests of electrical equipment, I have made the same push button ring a bell at the switchboard, where an assistant records the necessary electrical readings at the same instant, which are generally noted on an indicator card taken at the same time.

In testing steam turbines, the connection between the autographic water chart and the brake horse-power determinations are very interesting and instructive, and where the delivered power is taken from the readings of electrical instruments, (after proper corrections have been applied) equally instructive results are obtainable.

Where it is desired to measure the heat consumed by the engine, the records obtained by this method of testing become of great value, and with both engines and boilers tested at the same time it is a simple matter to start the heat balance from the coal pile and thus trace the entire efficiency of the apparatus from the coal pile to the crank shaft. From the data collected by this system, the cost of current per kilowatt is very accurately determined.

The National Cast Iron Pipe Company has been incorporated with a capital stock of $5,000, subject to increase to $300,000. It will erect a plant on a 50-acre tract of land at Boyles, near Birmingham, Ala., which will employ 400 to 500 men in the manufacture of gas and water pipe. A. H. Ford, president Birmingham Railway, Light & Power Company, has been elected president. Other Birmingham capitalists interested are George B. Tarrant, A. E. Nelson and F. M. Jackson. E. E. Linthicum, vice-president and general manager, will be in charge.

Handling Gun Jackets with a Lifting Magnet

According to J. C. Dillon, Jr., secretary of the Titusville Forge Company, Titusville, Pa., there are many uses for a lifting magnet in the company's plant. In addition to being adapted for numerous kinds of work, the magnets have proved themselves savers of labor and have promoted many economies in the handling of material.

In this plant lifting magnets are employed for unloading heavy steel billets, handling heavy forgings and loading crop ends or turnings. As an interesting example of the saving effected by its use, it is stated that formerly the cost of loading 25 tons of crop ends or turnings was $4.60, while with the magnet 25 tons of this material can be loaded at a cost of only 78c. On a tonnage basis, the

A Nickel Steel Jacket for a 6-In. Gun Being Handled by a 42-In. Lifting Magnet Made by the Electric Controller & Mfg. Company, Cleveland, Ohio

cost of handling material has been reduced from approximately 9c. to 1½c., including 6 per cent. interest on the cost of the magnet together with a 4 per cent. annual charge for depreciation. The accompanying engraving shows an interesting application of a 42-in. magnet built by the Electric Controller & Mfg. Company, Cleveland, Ohio, which is handling a 6-in. nickel steel gun jacket in the company's plant.

Increase in Machine Mining of Coal

The number of machines used in mining coal in 1911 was 13,819, an increase of 565 over 1910, according to a report by E. W. Parker, of the United States Geological Survey. The leading coal producing State, Pennsylvania, is also first in the total tonnage mined by the use of machines and in the total number of machines in use; but in the proportion of machine-mined coal to the total output Ohio far outranks all other states. In 1911 Pennsylvania's production of machine-mined coal was 69,131,923 net tons, or 47.76 per cent. of the total. Ohio's production of machine-mined coal was 26,556,630 net tons, or 86.33 per cent. of the total. Ohio is third in the production of machine-mined coal, though ranking fourth in the total production. West Virginia is the second State in coal production, is also second in the output of machine-mined coal, which in 1911 was 29,121,480 net tons, or 48.67 per cent. of the total. Illinois is fourth in the quantity of machine-mined coal, with 23,093,807 net tons.

Mr. Parker says that it is probably not an exaggeration to state that the bituminous mines of the United States could produce from 600,000,000 to 700,000,000 net tons of coal without opening another new mine.

In addition to the lessening of the mining cost, there are two other aims to be accomplished by the use of mining machines. The undercutting of coal by hand is one of the most exacting kinds of labor, and the use of machinery materially reduces the arduous tasks of the laborer. More important than this, however, it is Mr. Parker's belief, is the greater safety secured through reducing the practice, too prevalent in many mining districts, of "shooting from the solid."

The Anderson Engine Company has removed its main office to the Marquette Building, 140 South Dearborn street, Chicago.

A Large Multiple Feed-Water Strainer

The Lagonda Mfg. Company, Springfield, Ohio, has placed on the market a line of multiple strainers for which special claims are made as to the ease of cleaning. The function of these strainers is to remove the solid matter, such as leaves, ice, sticks, fish, sand, etc., which is held in suspension in circulating and boiler feed-water when the source of supply is a natural one like a river or pond. A screen over the end of the intake pipe is the ordinary method of removing these foreign substances, but it is pointed out that these screens soon become foul and interfere with the flow of water, thus putting an extra load on the pump. As the ordinary strainer cannot be cleaned without stopping the pump, a considerable loss of time and money is entailed. Recently the company has completed a 30-in. strainer with three baskets for the Southern California Edison Company. Fig. 1 is a view of the strainer, while Fig. 2 illustrates the arrangement of the straining baskets, the view, however, being a typical one, and not referring particularly to this special strainer.

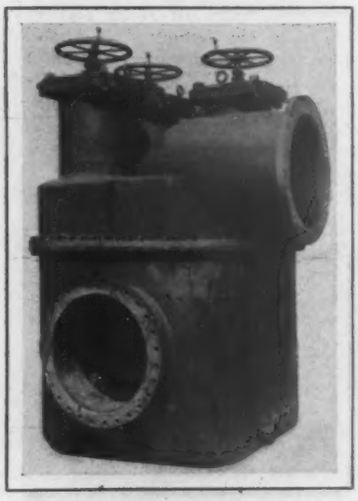


Fig. 1—A 30-In. Three-Basket Circulating Water Strainer Made by the Lagonda Mfg. Company, Springfield, Ohio

The total straining area of this 30-in. apparatus is three times the actual area of the intake pipe line, a feature which is an important factor since the flow of water can be cut off from one basket while it is being cleaned, the other two being more than sufficient to take care of the water passing through during the time this operation is being performed. The advantage claimed for the multiple system of baskets is the light weight of the different strainers, which enables one man to lift and clean any particular one. As the baskets are removed through the top of the strainer, it can be buried under the engineroom floor with only the top of the bonnet and the handwheel exposed. The water does not flow against the meshes of the strainer, but is directed downward against the bottom of the basket, which is protected by a solid metal plate, thus reducing the wear to a minimum. These strainers are furnished with from two to six baskets, and all working parts that come in contact with the water are of non-corrosive bronze or brass.

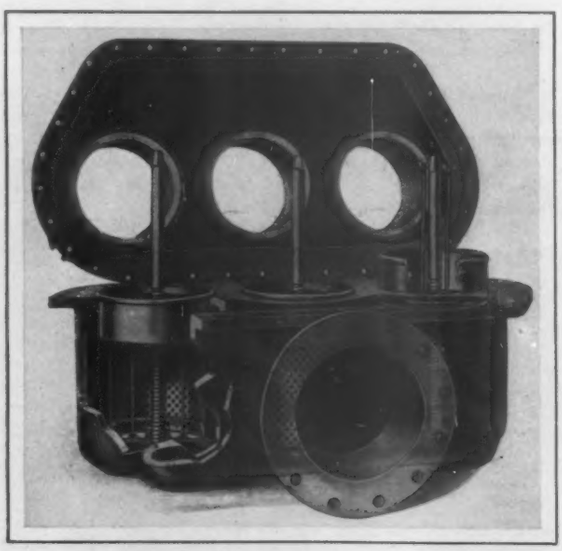
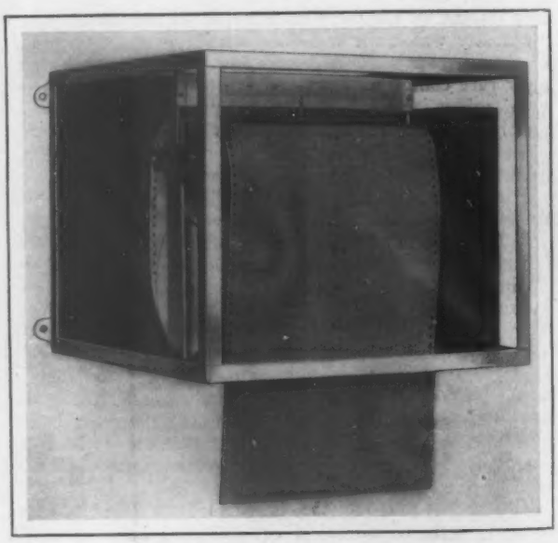


Fig. 2—View Showing General Arrangement of the Straining Baskets, Etc.

New Type Continuous Chart Recording Pyrometer

With a view to providing an instrument capable of furnishing a continuous record for a week or a month, the Brown Instrument Company, Philadelphia, Pa., has designed a new continuous chart recording instrument. The instrument is intended to be employed in operations requiring temperature measurements, but can also be used for indicating volts, amperes, speed, mechanical operations, etc., where a small current of electricity is required to operate the recording mechanism.

This instrument is of the frictionless type and the electrical milli-voltmeter system is the same as that used in the company's other types of recording pyrometers. The pen is pressed against the paper only momentarily at intervals of from 10 sec. to 1 min. as may be desired. The instrument carries a roll of paper sufficient to last six months and as the paper travels a little over 1 in. per hour, the dots made by the pen form a practically continuous line. In this way the necessity for changing charts daily is done away with, although the record can be torn off every day or week or it may be permitted to roll up continuously. The clock mechanism is wound once a week and at this time the pad which supplies the pen is inked. The clock mechanism brings the pad against the pen point at frequent intervals so that there is always sufficient ink to enable a record to be drawn.



A New Type of Continuous Chart Recording Pyrometer Developed by the Brown Instrument Company, Philadelphia, Pa.

As will be noticed from the accompanying engraving, the instrument is mounted on a metal base and is fully protected by a glass dustproof case which enables the record to be examined easily at all times. If desired this instrument can be used within 100 ft. of the point at which the temperature is measured, or it can be installed some distance away. Either base metal or platinum-rhodium thermocouples can be used.

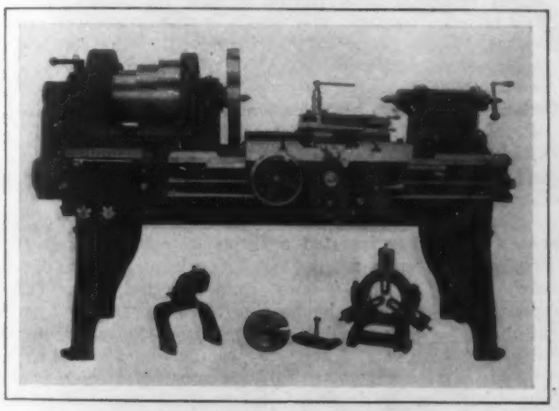
The smoke problem came in for considerable attention at the Cincinnati municipal budget exhibition held in Cincinnati, October 1 to 15. The chief smoke inspector, A. G. Hall, had a display of a boiler and furnace equipped with instruments used by his department, together with placards indicating their use in determining the cause of smoke. The apparatus includes gas analyzers, pyrometers, draft gauges and the like. One thickness of gray glass of such capacity that it will intercept 60 per cent. of the light of a 16-cp. flame is taken as a basis in the smoke regulations, and four such thicknesses are regarded as corresponding to No. 1 or dense smoke.

A New 18-In. Heavy Duty Engine Lathe

Rapid production, accuracy of alignment and durability are the special features characterizing a new 18-in. heavy duty engine lathe, which has been brought out by the Mueller Machine Tool Company, Cincinnati, Ohio. The tool is designed along the lines now considered standard practice and the construction is heavy and massive.

The headstock, which is of heavy construction, is ribbed and cross ribbed and is securely bolted to the bed. There are three steps in the cone-driving pulley, which range in diameter from 9¼ to 13 5/32 in., and are wide enough to accommodate a 3½-in. double belt. This pulley is locked to the face gear by a spring pull pin. The tailstock is equally massive in proportion, with two ¾-in. bolts for clamping it to the bed. It is arranged with two plug clamps to lock the spindle without throwing it out of the line. Both the head and the tailstock are set off center, which permits work unusually large in diameter to be turned without the bottom slide on the carriage overhanging its bearing. In this way, it is pointed out, great rigidity is secured. The diameter of the barrel bearing is 2¼ in., and its movement is 8¼ in.

The spindle, which is made of high carbon crucible steel, and finished by grinding, has a No. 4 Morse taper and a 1 9/16-in. hole extending its entire length. The spindle boxes are lined with phosphor bronze bored and



A New 18-In. Heavy Duty Engine Lathe with a 6-Ft. Bed Built by the Mueller Machine Tool Company, Cincinnati, Ohio

hand scraped to fit the spindle. Sight feed oilers are employed to lubricate the bearings and felt pads which reach into the reservoirs of the oilers filter the lubricant. A hardened and ground thrust collar is provided and the end motion is taken up by a nut at the end of the spindle. Means for any necessary adjustment of the spindle are also provided. The speed range extends from 13 to 300 r.p.m., arranged in nine steps in approximate geometrical progression, which it is pointed out gives a good range for general manufacturing purposes. Forty-five screw threads ranging from 2 to 60, and including an 11½-in. pipe thread can be cut, all the changes being obtained within the quick-change gear box itself. The ends of the shafts of the gear box and reversing gears of the head are arranged to receive change gears for special and metric thread cutting. All the threads can be cut without the removal of a gear and the chasing dial on the carriage allows the operator to catch threads instantly without having to return the carriage either by reversing the countershaft or stopping the lathe. The feeds are positively geared and are four times the threads. The feed can be started, stopped or reversed in the apron or head for either cross or lateral feed motion only when the lead screw nut is disengaged.

Great vertical depth characterizes the bed, which is firmly braced throughout its entire length with heavy cross girths which absorb the vibration of the heaviest cuts. The rear bearing is flat. The rack is a single piece of machine-cut steel, and is fastened by screws from the front of the bed. The rack pinion is of hardened tool steel. The carriage has an exceptionally long bearing on the V's throughout its entire length, and has a cross V 8¼ in. wide with an extra amount of metal in the cross-bridge. It is securely gibbed to the bed and has an adjustable taper gib which extends the full length of the bearing against the rear side of the bed. In this way, it is emphasized, the possibility of any twisting of the carriage while very heavy cuts are being taken has been eliminated. A long shear wiper and oiler is fastened to each end of the carriage bearings on the shear and automatically wipes the shear free of chips and dirt, and oils it as the carriage moves along. The apron is a rectangular box in which all the bearings for the gears and screws are cast integral with the apron itself. Bearings on both sides are provided for all the gears, and the studs are of hardened and ground steel. The feeds are arranged so that only one can be in operation at a time. The apron is fastened to the carriage by a tongue and groove and also by bolts. The lead screw is 1 9/16 in. in diameter, and has a 4-pitch thread. It is rotated only when screw threads are being cut. The upper slide of the compound rest is bolted to the swivel base with four screws to insure rigidity.

The countershaft has double friction pulleys 14 in. in diameter, arranged for a 5-in. belt. The belts run forward and no reversing belt is required. The speeds of the countershaft, which is fitted with heavy rigid bearings and hangers, are 175 and 210 r.p.m. All of the gears in the quick-change gear box are of steel and have champfered teeth. In the places where the strain is severe throughout the machine steel gears are also employed and all gears are entirely covered.

The lathe swings 18½ in. over the ways and 13¼ in. over the carriage. The length of bed regularly supplied is 75¼ in., which enables work not exceeding 28½ in. to be turned between centers. The net weight of the lathe is 3200 lb. The equipment regularly furnished consists of two face plates for large and small stock, compound, steady and follow rests, a countershaft and the necessary wrenches. If desired, a longer bed and motor drive can be supplied at a slight extra cost.

A New Thickness Gauge for Sheet Materials

Several new principles are embodied in a new gauge for measuring the thickness of paper, boards, sheet metal and rubber, leather and any other type of sheet material which has been brought out by the Ashcroft Mfg. Company, 85 Liberty street, New York City. The capacity of the device is 0.11 in. and the white enameled dial renders the gauge easy to read.

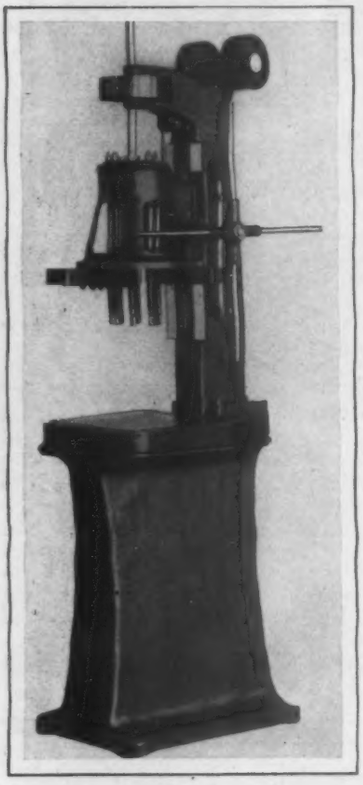
The gauge is held in the hand as shown in the accompanying engraving and the material to be measured is inserted between the jaws which are opened by pressing the push button with the fingers. When the pressure on the push button is released the jaws close automatically and the thickness of material is indicated on the dial. The measuring surfaces which come in contact with the material are ⅜ in. long, which, it is emphasized, is sufficient to permit the gauge to take an accurate reading of the surface of the sheet which in the case of some materials may be slightly uneven. The dial on which the thickness of the material is indicated is finished in white enamel and the graduations stand out distinctly. The dial is graduated in thousandths of an inch by dashes and this space is divided by dots, thus making it possible to read the gauge to 0.00025 in.

An Improved Type of Gauge for Measuring the Thickness of Sheet Materials Made by the Ashcroft Mfg. Company, New York City

In the construction of the gauge all sliding parts have been eliminated, the movement being mounted on steel pivots. In this way it is pointed out that friction and wear are reduced to a minimum.

Small Multiple-Spindle Drilling Machine

A new multiple-spindle drilling machine which is designed for either bench or floor use has been added to the line built by the National Automatic Tool Company, Richmond, Ind. This machine is known as the No. 9 type D, and is either mounted on a stand for floor use, as shown in the accompanying engraving or, with the stand removed, can be mounted on the bench. Although light enough to be easily moved from one department to another, as circumstances may require, the machine is strong and rigid. The principal object in the design of this drilling machine was to displace to a large extent multiple-spindle drilling fixtures, which are not only entirely special, but also require a large drilling machine to drive them.



The New No. 9-D Multiple-Spindle Bench or Floor Drilling Machine Built by the National Automatic Tool Company, Richmond, Ind.

In general construction the machine resembles the company's other multiple-spindle drilling machines, one of which was illustrated in *The Iron Age*, January 25, 1912, with the exception that the spindle speeds are not independently changeable since the largest size of drill used is ¼ in. in diameter. The head, which has a bearing of 11¼ in. and a travel of 12 in., feeds down to the work by a rack and pinion. It is counterbalanced and has adjustable stops for drilling holes to any predetermined depth and adjusting gibs to compensate for wear. The maximum size of work handled is a circle 8¾ in. in diameter. The working surface of the base is 14½ in. square, but the dimensions over the oil groove are 17¼ x 18¼ in. All the gears in the machine are cut from the solid and all bearings are bushed with a special grade of phosphor bronze.

The capacity of the machine is ¼-in. drills in steel, and the same rail and joint construction is used on this machine as on the larger ones. The rails, which are made of steel, are rigid enough to withstand any deflection, and have a bearing of 4 in. for the spindle. They have vertical adjustments within the spindle for different lengths of straight-shank drills which are held by special spring steel collets. Ball-thrust bearings adjustable for wear with ample oiling facilities are provided. There are two sizes of rails used. In the No. 1 rail, 3/16-in. drills, spaced 21/32 in. between centers, can be used and in the No. 2 rail the drills are ¼ in. in diameter and the minimum center distance is 25/32 in. Special rails can be furnished if shorter center distances are desired. The maximum distance from the end of the spindle to the top of the base is 15 in. and the minimum distance is 3 in.

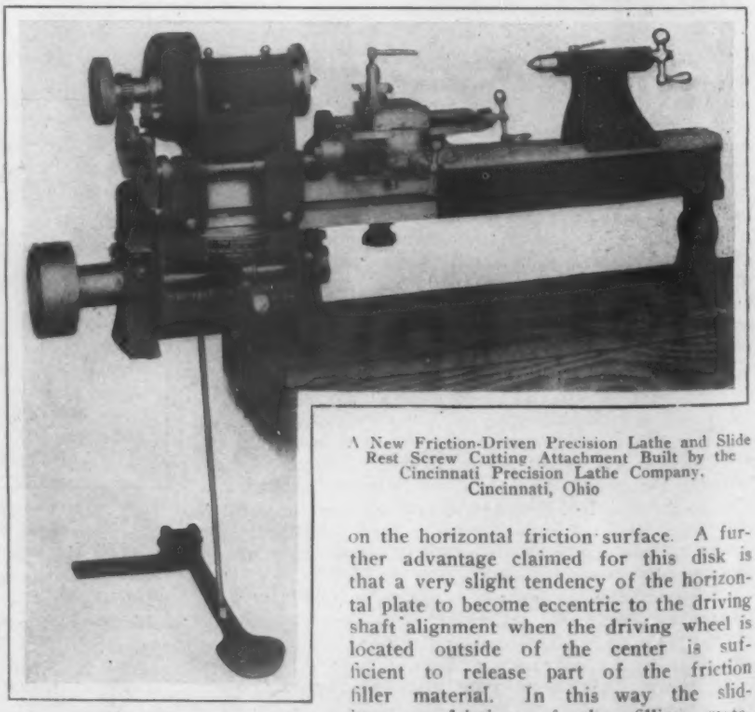
Cluster boxes in which all the spindles are accurately located are furnished for this machine, and it is pointed out that with a cluster box equipment it is possible to drill a larger number of holes than with adjustable rails, the factors controlling the number of holes being the kind of material and the size of the bore. In addition the use of cluster boxes does away with the time of changing rails from one drilling layout to another, and any number of cluster boxes can be used on each machine, as all are readily interchangeable.

The hight of the machine without the stand is 48 in., and 80 in. when mounted as shown. The floor space of the machine mounted on a stand is 19⅛ x 28 in., the weight when arranged for bench use, including the countershaft, is 525 lb., and 900 lb. when mounted on a stand. In the accompanying engraving the machine is shown arranged for a belt drive, but if desired electric motor drive can also be furnished.

New Friction-Driven Precision Lathe

The Cincinnati Precision Lathe Company, Cincinnati, Ohio, has recently placed on the market a new friction-driven precision lathe having a slide rest screw cutting attachment. In this new machine the friction driving principle is the same as that employed in the company's lathes, which were illustrated in *The Iron Age*, May 2 and October 3, 1912. The type of control is new and is believed to possess several advantages. These are the use of a self-contained spring tension or cushioned disk in which the friction between the two parts is easily adjusted and an increased tension as the driving wheel approaches the center of the driven disk.

The cushioned disk used consists of two members between which are inserted a series of coiled springs and steel guiding studs, a large one being located in the center with a series of smaller ones around the periphery. These studs, together with the bearing, fit between the flanges on the lower disk member and the outer edge of the upper disk, to which is attached the gear-driving stud. In this way, it is pointed out, a uniform constant tension is insured between the driving friction members and all points on the horizontal friction surface. A further advantage claimed for this disk is that a very slight tendency of the horizontal plate to become eccentric to the driving shaft alignment when the driving wheel is located outside of the center is sufficient to release part of the friction filler material. In this way the sliding or friction of the filling material against itself is eliminated so that more power is secured and there is less loss of friction material. As the friction filler is applied in the varying positions on



A New Friction-Driven Precision Lathe and Slide Rest Screw Cutting Attachment Built by the Cincinnati Precision Lathe Company, Cincinnati, Ohio

both sides of the disk center in getting forward and reverse speeds, the filler driving surface is caused to wear uniformly and parallel to the friction-driving shaft. As the driving wheel approaches the center of the disk the spring tension becomes slightly more pronounced since the wheel comes directly under an increasing number of springs as it approaches the higher speed disk locations. It is also claimed for this arrangement that since the horizontal friction disk is the driven member if the machine should become overloaded and the frictions caused to slip the driving friction wheel would continue to revolve and uniform wear take place all the way around.

The friction hand control lever is made in two parts, which are bolted together to form a circular sliding ring. This ring is inserted in a circular recess or slot in a hub on the friction-driving steel body, which rotates inside of the control lever ring. The wheel slides on the friction-driving shaft and a longitudinal key which is inserted in the shaft with perfect freedom when the friction members are engaged. The lower side of the control hand lever is so shaped that it readily drops into sector graduations in the front gear cover for retaining the friction-driving wheel at the desired speed locations on the friction disk.

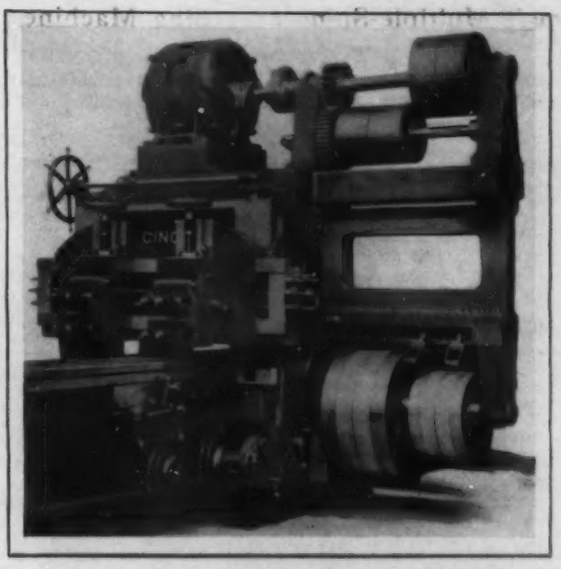
A foot pedal release, consisting of two arms or levers, is also employed. The ends of these levers are bushed with fibre rolls, which are so arranged that when pressure is applied to the foot pedal the friction disk surface is raised, thus disengaging the friction-driving members. At the same time these rolls act as a brake to stop the machine almost instantly. The speed changes in either direction are made very rapidly, and as the spindle is stopped and started almost instantaneously threads can be cut up against the shoulder with safety. For keeping the lifting members away from the disk when the machine is in motion there is a spring between the bench and the lever cross arm which is not shown. If it is desired to stop the machine for any great length of time the foot pedal is pushed under a retaining stop on the floor.

Large Frog and Switch Planing Machine

A new 36-in. planing machine designed especially for frog and switch work of the heaviest class has been added by the Cincinnati Planer Company, Cincinnati, Ohio, to its line. The principal features of the machine are a four-belt drive, the furnishing of the V's of the bed with forced lubrication, the mounting of the countershaft on top of the housings and the fitting of a heavy cast-iron frame between the upper and lower bearings. In the accompanying engraving only the driving end of the machine is shown.

The bed is of deep pattern and is braced throughout by box girders. Between the housings where the greatest strain is produced there are four walls. The V's are extra wide and are furnished with forced lubrication by a pump which keeps a film of oil between the bed and the table at all times. The table is 32 in. wide and is of massive proportions. There is an inside bearing on the bed extending the entire length, which it is emphasized overcomes the pressure of heavy side cuts. To prevent lifting adjustable steel gibs are provided on each side.

The housings are of box form with a 10-in. face and extend to the floor. They are secured to the bed by large bolts and dowel pins, and in addition are tongued and grooved. A heavy cast-iron frame is fitted between the upper and lower bearings, and is also fastened to the housings with a view to preventing spring in the shafts or bearings under very heavy cuts. The cross rail is 20 in. wide and has a deep ribbed box brace on the back for increased stiffness. In addition to the regular outside set of clamps, it is secured to the housings by an extra set on the inside, the arrangement making a rigid construction. If desired the cross rail can be fastened to the housing by large dowel pins at various fixed hights. The rail screw has two long nuts in the saddle, an arrangement which it is emphasized reduces the strain on the threads one-half when taking heavy side cuts and also insures long life to the screw and the nut. The heads have automatic cross and vertical feeds and are made right and left so that they can be brought close together. The saddle and the harp are made in one piece without a swivel, and have a bearing on the rail of 25 in. Steel is employed for the tool block and the clapper box. The shifting mechanism has a safety locking device which prevents the table from starting except when desired by the operator. The arrangement of the levers is such that the machine can be operated from either side.



View of the Driving End of a Heavy 36-In. Frog and Switch Planing Machine Built by the Cincinnati Planer Company, Cincinnati, Ohio

The driving shafts are very large in diameter, and are made from special crucible steel. They are finished by grinding and run in long bearings which are fitted solidly into the bed. One of the special features of the machine is the four-belt drive, the machine being driven by two 4-in. belts. The driving pulleys are 34 in. in diameter and are made from an aluminum alloy, which enables the machine to be reversed quickly on short strokes. The construction of these pulleys is such that they do not require oiling more frequently than once in 60 days. The countershaft is mounted on top of the housings, thus making the machine self-contained. Solid crucible steel is employed for the rack and gearing, which is designed to withstand the great strain incident to frog and switch work. The bull wheel and rack are very wide and coarse, the width being 12 in. and the pitch 1½.

State-Owned Mines in Minnesota

Mines developed on lands owned by the State of Minnesota and operated under lease are expected to ship 1,600,000 tons of ore this year. This outgo will exceed by 500,000 tons the high record established in 1910. The royalties on the ore produced will aggregate $400,000, in addition to which the State will receive $100,000 as its income from mining properties not yet developed. A total of 190 mineral leases are outstanding. Fifty tracts that have been drilled have been shown to contain ore, and half of these have been opened as mines. Twenty-two properties are shipping this season. All are on the Mesaba range with the exception of the Thompson, which mine is in the Cuyuna district. It is estimated that the 50 tracts whose mineral worth has been determined hold 150,000,000 tons of ore, five properties containing 46,000,000 tons. The leases are issued for a term of 50 years; the average remaining life of those outstanding is 38 years. The latest State property to be added to the shipping list is the Morton mine, operated by Tod, Stambaugh & Co., Cleveland, Ohio. The tract is two miles southeast of Hibbing, Mesaba range, comprising 80 acres, and has a deposit figured at not less than 5,000,000 tons. The Morton is producing only on a small scale this year, but next season it is expected to forward approximately 500,000 tons.

Measuring efficiency in manufacture is the announced subject of the New York meeting of the American Society of Mechanical Engineers scheduled to take place Tuesday, November 12, at 8.15 p. m., at 29 West Thirty-ninth street, New York. A paper, to be presented by Edward B. Passano, Baltimore, will open the meeting.

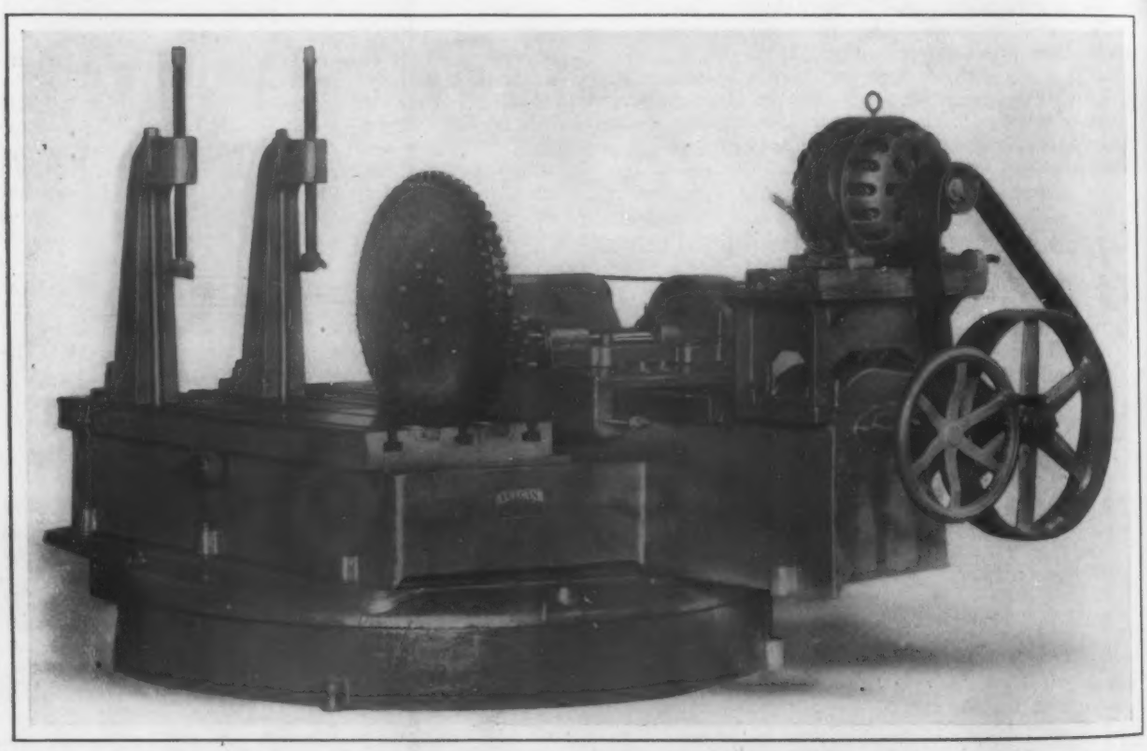
New Sawing and Rotary Planing Machine

A new type of combined sawing and rotary planing machine mounted on a roller-bearing turntable base is now being placed on the market by the Vulcan Engineering Sales Company, 2014 Fisher Building, Chicago, Ill. In addition to the distinctive turntable feature which gives the machine a wide adaptability in a limited floor space and permits the cutting of long pieces from any angle, this machine embodies a number of improvements over previous patterns of the QMS saws. The machine is equipped with pulleys for straight belt drive or provision is made for mounting a motor as shown, using a belt drive instead of gears. The use of the belt prevents the stripping of driving gears in event of the saw sticking in the work.

The milling head is easily interchangeable with a saw blade and the sprocket arbor by which the planer head and the saw blade are driven from their peripheries has a forward adjustment of 5 in., thus eliminating the necessity of changing sprockets when the saw blades have been recut. The saw arbor is also adjustable for wear. As compared with the older form of arbor drive, the periphery sprocket produces a much more powerful cutting effect with the same strain on the machine and the blade and also permits the use of teeth with much coarser pitch, thus affording a correspondingly greater clearance for chips.

The machine illustrated carries a saw blade of 31¼ in. in diameter, or a milling head with a diameter of 28¾ in. over the cutter tools. The saw blade carriage has a travel of 36 in., with an adjustable stop, and the saw blade runs at about 48 ft. per minute. The feed is of the adjustable variable-speed friction type, changeable at all times from ¼ to 1 in. The feed motion is transmitted to the feed screw through a clutch which can be released to permit the adjustment of the carriage by hand. The machine has capacity for rounds up to 12 in., squares up to 10¾ in. and structural shapes up to 24-in. I-beams.

The side table, which is adjustable laterally, also carries an upper side-table when the planer head is not in use, upon which a V block is cast for the quick clamping of rounds or squares. Other clamps suitable for various kinds of work are likewise supplied.



The New QMS Combined Sawing and Rotary Planing Machine Sold by the Vulcan Engineering Sales Company, Chicago, Ill.

Alaska will contribute to the world's output of copper this year about 20,000 tons, compared with about 13,500 tons last year.

A New Small Skull-Cracker Lifting Magnet

For skull-cracker work and various other operations such as handling light finished parts, castings, etc., the Cutler-Hammer Clutch Company, Milwaukee, Wis., has added another small lifting magnet to its line. This can be used to advantage for the classes of work mentioned and is of the 24-in. circular type. It is a development of the magnet recently sold for submarine service and is made rugged and waterproof the same as the larger ones. The terminals of the magnet coil are permanently insulated, the same construction which proved successful in the larger magnet being employed. The net weight of this 24-in. magnet is only 750 lb. and it can lift 24 and 36 in. skull-cracker balls weighing ten times its own weight easily.

Iron Coke.—A paper on "Iron Coke" was presented by Dr. A. P. Lidoff, Charkor, Russia, to the recent International Congress of Applied Chemistry, New York City. He stated that by repeatedly passing dust from blast furnaces through magnetic machines it is possible to obtain a product the greater part of which is ferric-oxide. If the product thus obtained is mixed with gas coal slack (in proportion of one part of dust to two or three parts of coal) and it is subjected to a high temperature under pressure, there is obtained a porous coke containing metallic iron regularly distributed through it. The specific gravity of this coke and its strength and porosity are, he said, dependent on the quality of the coal and the composition of the dust. The iron coke thus made by the utilization of two very cheap substances he regarded as useful in the mechanical industry in several ways: for the manufacture of electrodes, for working metals at high temperatures, for decolorizing solutions, and for use as a filtering medium.

Lap-welded steel pipe used under 286 lb. working pressure has been installed by the Homestake Mining Company, Lead, S. D., to conduct water to a 6000-hp. hydroelectric plant. The high-pressure portion of the line consists of 30-in. lap-welded steel pipe made by the American Spiral Pipe Works, Chicago. The middle portion consists of 32-in. lap-welded steel pipe and the upper portion of 34-in. spiral riveted pipe. Forged steel connections are used throughout.

Pittsburgh Meeting Iron and Steel Institute

A Record Attendance and a Day of Important Papers and Discussions on Commercial and Technical Questions

The Pittsburgh meeting of the American Iron and Steel Institute, on Friday, October 25, which on the programme was set down as the "third general meeting," brought out the largest attendance in the brief history of the organization. The total registration was 375, and President Gary referred in his opening address to the fact that about one-half the present membership, nearly 750, was then gathered in one room—a most unusual thing at a meeting of a manufacturing or engineering organization.

Many new faces were seen. The young men in the operating and selling departments of the leading steel companies have been joining the Institute in large numbers in the past year. The opportunity to catch step with this educational movement led by men long prominent in iron and steel manufacture has appealed strongly to the growing, pushing element in the trade. Other scores of young men, who will make their way to places of leadership in the industry, are yet to come into the organization.

The Pittsburgh meeting emphasized the fact that the drift of the steel manufacture in recent years into the control of large corporations has not borne out the prediction of some economists that that period in the development of the industry would mean the arresting of progress through inventions and improvement of practice. The theory that the stimulus to improvement would not be the same as in the days of a multitude of small manufacturing companies has been thoroughly discredited. The Pittsburgh meeting, like the May meeting in New York, produced a volume of literature indicating that the spirit of progress was never more assertive in the American steel industry. Another thing noticed was that the months of sharp competition for business have not brought back the asperities of the old days. The régime of co-operation in the few years following the bankers' panic of 1907 has evidently made a permanent contribution of friendly personal relations.

While a two-day meeting was announced, there was but one day of sessions. Saturday had been set apart for visits to various steel plants in the Pittsburgh district. This feature was not made much of, however, as Pittsburgh was familiar ground to most of the members in attendance; yet several parties of the younger men set out on Saturday morning to make the rounds of the most noteworthy plants.

President Gary's Address

President E. H. Gary, whose leadership in the Institute movement has been marked, called the first session to order at the Hotel Schenley at 10 o'clock Friday morning. His address, as has been the case at every similar meeting, was given a close and appreciative hearing. It was as follows:

The city of Pittsburgh is an appropriate place for this meeting. It is the center of the iron and steel industry of this country, and in this line of business activity its influence is felt in every country of the world. The Pittsburgh district, confined to the city and its immediate surroundings, produces about one-third of the iron and steel manufactured in the United States and about 13 per cent. of the total production of the world. With its natural advantages and location, which tend to reduce the general cost of assembly, production and distribution to the minimum, it is safe to conclude that in the future, as in the past, its commanding position as a steel center cannot be questioned. Much might be said, and would be said if time permitted, favorable to the reputation and active strength of this great city concerning all that makes for the betterment of the human race.

Steel Trade Prosperity in Spite of Hindrances

And we are here under conditions that are most gratifying. We are in the midst of an era of prosperity never before surpassed so far as it affects our particular lines. These conditions have not resulted from the application of political policies or efforts, but exist in spite of them. They are here because nothing could prevent. In the first place, for the last few years, following the bankers' panic of 1907, there has existed a feeling of uncertainty and a lack of confidence, which have deterred the great purchasing public from entering the market, even to the extent of supplying their necessities. This has been especially true of the railroad companies, who are among our largest patrons. In consequence, the necessities of the consumers have piled up to such an extent that they have lately been forced to increase their purchases materially. When, therefore, the railroad companies and others similarly situated commenced to buy, the general influence and effect were immediately felt, and buying on a large scale has developed. Moreover, the bountiful crops and sound basic conditions of the country have made everyone realize more clearly than ever before that prosperity in this splendid country of ours is to be the rule and not the exception, notwithstanding at times we may be surrounded by adverse influences and unwarrantable interference, which in any ordinary country would bring prolonged distress and suffering. So we are happy to-day in the knowledge that we have on our books orders which will keep our mills running to their full capacity for months to come. Let us hope and pray that nothing shall be done to interfere with our continued success.

A Strong Programme

We have for the day a programme which will afford us great pleasure and benefit. Those of you who were present at the annual meeting of the Institute held in New York in the month of May were probably greatly surprised and greatly entertained by the papers which were read. It is doubtful whether any similar institution ever held a meeting at which so many addresses of equal merit were delivered. It seemed to all of us present that so long as we could boast of a membership including men of the character, learning and ability of those who spoke, our institute could be depended upon to occupy and maintain a position of the highest rank in associations of this kind. I am sure we are to have a similar experience to-day. It is safe to say in advance of the delivery of the addresses to be made that they will show a breadth of learning and thought which will demonstrate that this great industry in the United States is in charge of men who are fully competent to compete successfully with the learned and skillful men of other nations, all of whom are our friends and yet are most vigilant and successful competitors. It is a great honor, and certainly a great pleasure, to be a member of this institute and associated with such men.

Pending Questions of Great Moment

But neither the technical questions connected with our business nor even its material growth should be treated as the all-important or the most important subjects which must be considered and passed upon by the members of the institute. Questions of great magnitude and concern

are at present agitating the minds of the people throughout the world. We may be stubbornly oblivious to some of them, but we ought not to be. We refuse to consider, or at least postpone consideration of, many of them. The questions are international, national and domestic, and they involve the welfare of everyone. We are disposed to wrap around ourselves the cloak of self-righteousness, or we proclaim that we rely upon the stability of the government or the majesty of the law, and we consider ourselves safe, whether within our vision everything seems to be calm and tranquil or otherwise. We sometimes forget that it is the masses of the people who determine final results; that they may establish and abolish governments; that they may make and unmake constitutions. Sooner or later they bring about conditions satisfactory to them, even by resorting to destructive measures. They have the might and they can determine for themselves what is the right. They believe in the sentiment, to quote from a French writer on French history, that "there is a bigotry in politics as well as in religion, and it is the worst of bigotry to reject change as something which is inherently bad. Laws to be permanently useful must vary with the varying condition of man."

I am dealing in generalities, not intending to be specific or to make personal reference. The thought I would leave with you is that there is no way of permanently settling any great question involving the welfare of humankind except on the basis of right and justice. Position, wealth, influence, laws are helpless as a means of establishing a rule for human conduct unless supported by principles of justice and righteousness. The unfair or unreasonable or dishonest man, whether in public life or private life, may succeed temporarily; but it is only a question of time when he will be discovered and overthrown. The members of this institute have and will continue to have in an increasing measure great influence in the solution of the problems of to-day and the future, and you will give good account of yourselves. In our daily walk and conversation, in our attitude and demeanor toward all with whom we come in contact, each of us must be certain he is governed by motives which are honorable and just. You have made and are making great strides in the direction which I have indicated. You have secured and will hold the respect of all who know you, and, better than that, you have the approval of your own consciences.

Technical and Business Sessions

The first paper of the morning was by John L. Haines, assistant to the vice-president Jones & Laughlin Steel Company, on 'The Buyer from the Manufacturer's Standpoint." This with all other papers of the day which are now available for print will be found on other pages of this issue.

Technical Training for Steel Salesmen

No discussion of Mr. Haines's paper was scheduled, and he was followed by James M. Camp, Carnegie Steel Company, who told the story of the development of that company's interesting method of giving its salesmen in their formative days an insight into iron and steel manufacturing processes and the practice of the mills. The discussion of Mr. Camp's paper by Eugene P. Thomas, president United States Steel Products Company, was a paper in itself, the idea he developed being that of drawing upon the operating department for men there who showed an aptitude for salesmanship, and the kindred idea of choosing salesmen from the ranks of technical school graduates.

Mayari Iron in the Foundry

In describing "The Use of Mayari Iron in Foundry Mixtures," Quincy Bent of Sparrow's Point, Md., told how the Maryland Steel Company had almost by accident found the adaptation of its Mayari pig iron to special iron foundry uses. Edward B. Cook made the only comment offered on Mr. Bent's paper, saying that his company, the Warwick Iron & Steel Company, had used a certain percentage of Mayari ore in its blast furnace mixture at Pottstown, Pa., and had produced a pig iron containing 0.50 to 0.60 chromium and 0.5 nickel which when used in the cupola with 40 to 50 per cent. scrap gave a chromium and nickel content in the casting which increased its tensile strength 10 to 15 per cent. and made a cleaner casting. For this iron his company had been able to get a premium.

In treating of "The Manufacture of Ordnance at Bethlehem Steel Works," E. G. Grace, vice-president and general manager Bethlehem Steel Company, gave information not generally available as to the processes employed and the design followed in the manufacture of guns, projectiles and armor plate. A 20-ft. sectional drawing was shown of one of the 12-in. guns, 50 ft. long, built at South Bethlehem for Argentina, and another drawing was given of the Bethlehem armor-piercing projectiles. These two sections of the paper were followed with special interest by Mr. Grace's audience, since they gave an insight into operations somewhat less familiar than those connected with armor plate manufacture. As an interpolation at one point in the reading of the paper the speaker said that at one time the life of a 12-in. gun was considered to be the life of its liner, or about 100 rounds. To-day liners are replaced and the life of the gun has therefore been indefinitely prolonged.

Social Features

The adjournment of the morning session was followed by the serving of a buffet luncheon in rooms adjoining the convention hall. This opportunity for the mingling of members and the making of acquaintance has been one of the best features of the Institute's meetings. It was especially opportune at Pittsburgh since so many of the members put in appearance there for the first time, and the men who have so long been known as the wheel horses of the industry had opportunity to see something of those who are coming along to take their places.

An important matter of conference at the noon intermission among officers of the Institute was the new responsibilities which it will assume on January 1 when the statistical and other work of the American Iron and Steel Association is taken over. It was evident in informal expressions made at Pittsburgh, though the matter did not come up at either session, that the importance of preserving the high standard so long maintained in American iron and steel statistics is not being lost sight of. The practical working out of this problem is a phase of the Institute's activities which will be followed closely by numerous interests.

Mine Ventilation in the Coke Regions

The first paper of Friday afternoon was by Austin King, chief mine inspector H. C. Frick Coke Company, on "Coal Mine Ventilation in the Connellsville Coke Region." It was an excellent account of the enlightened and advanced policy now governing coal mine operation. The writer showed that coal mine ventilation as a factor in the prevention or cause of mine explosions is now better known than ever. Figures he gave showed how far in excess of the law's requirements are the safety provisions made by the leading interests in the Connellsville district. The paper was discussed by Wilson A. Luce, general manager Ellsworth Collieries Company.

Iron Ore Beneficiation, Microscopy in Studying Steel and Electric Power in Mills

J. W. H. Hamilton, of Hamilton & Hansell, New York, described at length "Recent Developments in the Preparation of Iron Ores," showing his familiarity with the processes that are to be increasingly used as the supply of the highest grade ores is depleted.

C. Arthur White, who is connected with the Vandergrift plant of the American Sheet & Tin Plate Company, told of the advance in knowledge of the composition of steel and the defects traceable back to the ingot in a paper on "Microscopic Analysis of Steel Sheets." The paper and the photographic views accompanying it will appear in a later issue of *The Iron Age*.

The final paper of the day was by Stewart C. Coey, engineer Youngstown Sheet & Tube Company, on "Electric Power Production in Distribution in Steel Works." The written discussion of it by B. R. Shover, chief engineer Brier Hill Steel Company, appears elsewhere in connection with the paper. Allerton S. Cushman asked as to the electrolytic action on concrete footings and elsewhere with the use of high potential currents, since there was bound to be leakage. He suggested that the use of the alternating system would prevent that danger. Mr. Shover's reply was that in the use of low tension current little attention needs to be paid to insulation and leakage. With high tension current it is necessary to in-

sulate, and electrolysis from alternating current is practically nothing. As a matter of fact in either case the question of leakage is not a problem in connection with the use of electricity at steel works.

The Next Meeting

In his closing comment on the work of the two sessions President Gary said the paper had fully borne out the promise he made for the programme early in the day. The purpose of members of the Institute was to help one another. They had gathered together a body of men who could be depended upon to give the Institute a standing among the great organizations of the world and to make an important contribution to the prosperity of the country. Such a disposition to cooperate and work in friendly relations had been shown that it could be said that no secrets were made of the processes and practice of the industry as represented in the membership.

From R. H. Edmonds, of Baltimore, came a telegram which Judge Gary read, suggesting that the development of iron and steel manufacture in the South had been so important in recent years that the members of the Institute might well consider holding the next annual meeting at Birmingham, Ala. Judge Gary explained that the May meeting each year was scheduled for New York, according to the plan under which the Institute is now working, while the October meeting was expected to go to some interior point.

The Dinner

The banquet Friday night at the Hotel Schenley rounded out the day. Judge Gary presided and at the main table were presidents of a number of steel companies, with H. Oeking, Duesseldorf, Germany, and Benjamin Talbot, Middlesbrough, England, as guests of honor. The members were seated at small tables in groups of eight.

The entertainment provided consisted of the "Iron Mine to Molder" motion pictures of Rogers, Brown & Co., of which a detailed account has already been given in these columns. William A. Rogers told of the collection of the pictures by his firm for purposes of advertisement, many of the operations shown being those carried out at their own iron mines and furnaces. Other parts of the film story were supplied by mines, railroads, docks and vessels of the Steel Corporation, while certain steel works operations were shown as carried out in the Bessemer and rail mill departments of the Lackawanna Steel Company. The views were explained by H. B. B. Yergason, of the Cincinnati office of Rogers, Brown & Co. He had personally secured them and his comment was entertaining and illuminating. It is within bounds to say that there has never been such a graphic and adequate setting out of the modern methods of mining, transporting and handling ore, turning it into pig iron and of converting pig iron into Bessemer steel rails as is given by these remarkable rolls of films.

Secretary McCleary, whose handling of the meeting was successful in every feature, announced at the banquet the arrangements made for visiting parties on Saturday to the McKeesport plant of the National Tube Company, the Homestead works of the Carnegie Steel Company, and the South Side and Aliquippa works of the Jones & Laughlin Steel Company. A number of automobile parties were made up to take these trips.

The Pittsburgh committee headed by Willis L. King gave a characteristic Pittsburgh touch to the local arrangements, which were well carried out. A striking thing was the badge of which the pendant medallion was a replica of the seal of the institute designed in 1910 by T. W. Robinson, of the Illinois Steel Company.

Members in Attendance

The following is the list of members who accepted for the banquet of Friday evening at the Hotel Schenley:

Franklin E. Abbott, W. E. Acomb, Taylor Alderdice, J. I. Andrews, M. Cochran Armour, Harry L. Austin.

Frank Baackes, R. W. Bailey, William M. Bailey, Alexander F. Banks, Duke N. Banks, Henry A. Barren, Jacob C. Barrett, George Bartol, Ephraim Bayard, Addison H. Beale, Horace A. Beale, Jr., Thomas A. Beattie, George H. Beaumont, Charles W. Bennett, Quincy Bent, Louis C. Bihler, E. L. Billingslea, W. W. Blackburn, Ernst Boley, Charles H. Booth, Henry P. Bope, Adolphe E. Borie, L. H. Bowman, H. S. Braman, Thomas J. Bray, Robt. E. Brooke, Edwin C. Brown, Fayette Brown, Jr., John Brunner, Daniel M. Buck, Eugene J. Buffington, Joel W. Burdick, Levi H. Burnett, Henry A. Butler, Joseph G. Butler, Jr.

James M. Camp, Louis J. Campbell, James A. Campbell, James J. Campbell, Augustus W. Carey, Perry E. Carhart, Robert B. Carnahan, Jr., Clyde Mitchell Carr, Walter C. Carroll, John B. Carse, John C. Chandler, S. H. Chauvenet, Eugene B. Clark, Edmund A. S. Clarke, Daniel M. Clemson, Walter H Clingerman, C. L. Close, Charles C. Cluff, William G. Clyde, D. H. Coble, L. E. Cochran, Stewart C. Coey, John P. Collins, Edgar S. Cook, Edward B. Cook, Howard D. Cook, Charles L. Cordes, William A. Cornelius, Frederick Crabtree, Theron I. Crane, W. D. Crawford, Alerton S. Cushman.

Charles I. Dailey, Thomas Darlington, James R. Darragh, Henry J. Davis, Stewart A. Davis, Montrose S. Dennis, Bradley Dewey, Ambrose N. Diehl, James W. Dietrick, Fred D. Dimmick, Alva C. Dinkey, Ambrose N. Dinkey, Charles E. Dinkey, W. H. Donner, John W. Dougherty, M. J. Dowling, George F. Downs, Daniel J. Driscoll, Herbert Du Puy

George P. Early, William H. Eaton, Richard H. Edmonds, C. H. Elliott, Mason Evans.

Charles T. Fairbairn, J. M. Faris, James A. Farrell, Charles Fell, E. C. Felton, A. I. Findley, William U. Follansbee, James H. Foster, Arthur A. Fowler, Lewis W. Francis, J. J. Fraggert, Fred M. Fuller.

Elbert H. Gary, James Gayley, Frederick C. Gedge, H. R. Gilbert, Walter H. Glasgow, Alexander Glass, John W. Gocher, Peter J. Gordon, Eugene G. Grace, Augustus B. Grange, Leslie J. Gray, James H. Grose, F. Justice Grugan.

Storm B. Haarbye, Edward J. Hagar, John L. Haines, Francis J. Hall, Edward J. Hamilton, John W. H. Hamilton, Nils V. Hansell, Charles Hart, Joshua A. Hatfield, Will L. Hayes, Benjamin P. Hazeltine, Henry W. Heedy, F. A. Heitmann, Axel H. Helander, Harry E. Higgins, J. H. Hillman, Jr., John A. Hock, Alexander L. Hoerr, William S. Horner, Herbert P. Howell, Elton Hoyt, 2d, John W. Hubbard, F. B. Hufnagel, I. Lamont Hughes, Azor R. Hunt, John A. Hunter, A. F. Huston, A. H. Hutchinson, O. N. Hutchinson.

William A. Irvin.

Ward W. Jacobs, W. A. James, Alexander Jarecki, Joseph W. Jeffrey, George S. Jenks, George W. Jewett, Joseph E. Johnson, Jr., Charles T. Johnston, Leslie M. Johnston, Harry R. Jones, Richard Jones, Jr., William L. Jones.

J. S. Keefe, Hugh Kennedy, Julian Kennedy, Thomas W. Kennedy, William W. Kennedy, Severn P. Ker, R. B. Kernahan, John P. Kessler, Jr., G. Cook Kimball, Austin King, Willis L. King, Robert C. Kirk, Luther L. Knox, E. C. Kreutzberg.

Robert P. Lamont, Edward Langenbach, Alexander Laughlin, George M. Laughlin, Jr., John F. Lewis, William H. Lewis, James Lippencott, John T. Llewellyn, Silas J. Llewellyn, F. Lorenz, Wilson A. Luce, Charles W. Lutz, Harry E. Lynch, Thomas Lynch.

William C. McCausland, Elmer T. McCleary, James T. McCleary, Samuel McClure, William McConway, Archibald McCrea, John A. McCulloch, Charles H. McCullough, Jr., Thomas McDonald, Charles B. McElhany, E. S. McElroy, William A. McGonagle, John W. McGrady, John McLeod, George F. McKay, Charles E. McKillips, Charles McKnight, Andrew E. Maccoun, Anson Mark, Charles D. Marshall, Clinton S. Marshall, Simon S. Martin, Amasa S. Mather, Samuel L. Mather, John A. Matthews, Daniel B. Meacham, David L. Mekeel, Robert J. Mercur, Eugene L. Messler, George Mesta, Charles L. Miller, John P. K. Miller, George E. Molleson, Leigh B. Morris, W. T. Mossman, Oliver M. Mowat, Edmund W. Mudge, James G. Mustin.

Albert L. Nash, John C. Neale, Robert W. Ney, Charles F. Niemann, Francis E. Norris, Frank R. Nullmeyer.

O. Offut, John W. Offut, H. Oeking, Paul Oeking, Edwin N. Ohl, John O'Keefe, Rudolph Ortmann, Edward O'Toole.

William P. Palmer, Eugene W. Pargny, C. P. Parker, Robert L. Parrish, Peter C. Patterson, Albert Patton, Leonard Peckitt, John A. Penton, Ward B. Perley, John O. Pew, James S. Phifer, Andrew Pinkerton, Arthur E. Piper, Charles E. Pope, Veryl Preston, Oscar L. Pringle.

Henry A. Raymond, William C. Reilly, David Reeves.

John Reis, J. Leonard Replogle, John V. W. Reynders, Frank C. Roberts, Alexander P. Robinson, Charles R. Robinson, C. Snelling Robinson, Theodore W. Robinson, S. M. Rodgers, William A. Rogers, Max Rozenkranz, Harry L. Rownd, William Fitzhugh Rust, C. F. W. Rys, Morrison Sander, W. F. Schleiter, William B. Schiller, Isaac M. Scott, James Scott, James H. Sheadle, Samuel B. Sheldon, William O'Neil Sherman, McGilvray Shiras, B. R. Shover, Jesse J. Shuman, John M. Sias, James Sim, Robert Skemp, Joseph R. Skewis, Jr., Edwin E. Slick, George Smart, Cameron C. Smith, James W. Smith, W. P. Snyder, Jr., Joseph T. Speer, F. N. Speller, John Stambaugh, W. A. Stanton, Rollin S. Steese, Archibald A. Stevenson, Malcom R. Stevenson, Walter C. Stone, Bradley Stoughton, William J. Sullivan.

Benjamin Talbot, Benjamin H. Taylor, John M. Taylor, Knox Taylor, Wade A. Taylor, Eugene P. Thomas, George Thomas, Leon E. Thomas, W. A. Thomas, T. Frame Thomson, Alexis W. Thompson, David Tod, Enrique Touceda.

Lawrence H. Underwood, Edward H. Utley.

William R. Walker, George B. Waterhouse, Ralph H. Watson, Samuel T. Wellman, Harry D. Westfall, John Wheeldon, Harlow B. Wheeler, William Whigham, Samuel H. Whitaker, G. Arthur White, H. S. White, George S. Whyte, C. F. Williams, Homer D. Williams, Idris R. Williams, Frank A. Wilmot, James W. Wilson, George E. Wisener, Hartley Wolle, F. W. Wood, Richard G. Wood, Walter Wood, Leonard G. Woods, Edward Worcester, E. H. Worth, W. P. Worth.

H. B. B. Yergason, Andrew G. Young.

E. M. Zehnder.

The Buyer from a Manufacturer's Standpoint*

BY JOHN L. HAINES†

The apprentice is told early in service by his thrifty instructor to do the hardest task first. Working on this principle, I will have the temerity to say of the buyer that he is largely responsible for many of the manufacturer's troubles. He wants always to buy at minimum prices. He puts on his orders all kinds of instructions and restrictions, adding cost, annoyance and delay to the work and hindering what he should aim to help—the prompt and economic execution of his orders. For these reasons he is sometimes looked upon as an enemy, rather than an ally, when after all such is not the case. This erroneous idea can only be found when one at least of the interested parties has failed to grasp the needs or efforts of the other.

Variation in Volume of Orders

We all know the proclivity of the hen. When eggs are needed the queen of the coop does not seem to be inclined to work overtime, but when eggs are plenty most hen yards work as near double turn as nature will permit. The buyer is similarly inclined. His yield of orders is very small when manufacturers need business, but when demand is strong it seems to be the desire of the buyer to order several times over what he is able to use or the mill or factory to produce.

No doubt this irregularity in buying can be partly attributed to the continued rivalry between supply and demand. In the race between these two forces sometimes demand outstrips supply, only to stir supply to greater effort and demand takes second place for a time. When supply is ahead of demand, we know in our great country the condition cannot long continue—and at such times some plan of "forebuying" (if we may coin the word) and storage may prove as advantageous to the iron and steel producers and their customers as the irrigation systems of the world have proved not only advantageous but necessary to the desert places.

It may be that the variation in volume of orders is partly caused by the fact that of late years contracts for some steel products are not considered binding when market conditions do not favor the buyer. This subject of contract obligations is a large one, and has been previously discussed by the Institute. It is certain, however, that if these obligations were regarded as real contracts, rather than options, and regularly specified against, the volume of orders going toward the steel mills would be more dependable.

Specifications Sometimes Too Stringent

Most of us in the steel business feel hampered at times by specifications of quality that seem unnecessary or too exacting. No maker of steel does or will object to rigid specifications, when the material covered by such specifications is to be used where human life or limb depend on the quality of material. Some buyers have, however, shown a tendency to insist on stringent specifications when there is no necessity for such severe demands. When an exacting specification is unnecessarily added to an order it causes trouble without benefit. It behooves all buyers to seriously consider when adding quality specifications to orders, and not, for instance, call for a sulphur limit of 0.035 or 0.040 per cent. in basic open-hearth steel when 0.05 per cent. of sulphur would do no harm. This naturally also applies to a too low limit on phosphorus, or lack of sufficient spread in carbon, manganese or physical requirements.

Then there is the careless buyer. What a troublemaker he is! In an endeavor to save time when writing orders he adds terms like "as before" or "as usual," thus sowing the seed of trouble, only possibly to reap the whirlwind.

Then there is the unscrupulous buyer, who intimates that the product could be of inferior quality, or weights may be reduced, in order to attempt a possible saving. The buyer who maliciously attempts such action can be best likened to a man smoking in a powder factory. He not only endangers himself but his associates, and while he may be willing to assume such risk, no insurance company would care to write a policy to cover the case.

In trying to point out the mote in the eye of the buyer, we must not overlook the beam the buyer may fancy he discovers in the eye of the manufacturer. Numerous charges are preferred by the buyer against the manufacturer. The buyer says the manufacturer does not look after the quality of his product as he should. He also says that service is not what it should be, and, once on the books, orders are not delivered as wanted, promised, or expected.

The Buyer and Seller Represent Extremes

The buyer and seller represent two extremes of business. The words of description are not so different. The buyer wants the best for the money; the manufacturer wants money for the best. The one offers money for material, the other material for money. Now while there is this big distinction between the man who buys and the man who sells, the basic foundation may not be so different. The good buyer is so on account of his training—added to his ability—and we can but think that the man whose training has made him a successful buyer would have been a good manufacturer had his life work been along that line. There are no doubt inborn traits particularly adapted to certain development, but it is chiefly environment and training that make one man a buyer and the other a manufacturer.

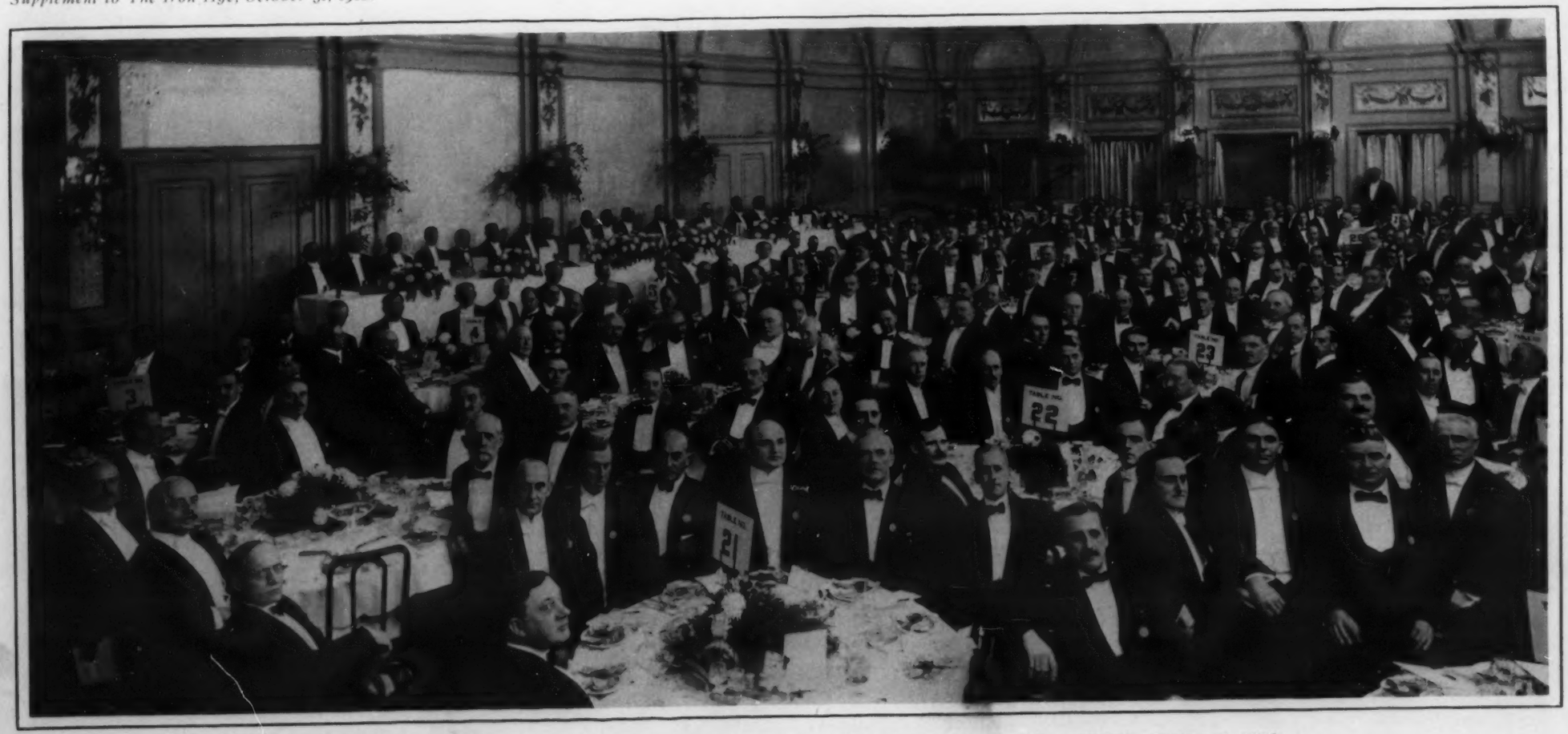
Fair Dealing

Many of the indictments against the buyer are exceptional and the same can be said of counter charges against the manufacturer. There should be, must be, and is a plane on which buyers and manufacturers can meet and do business in comfort and satisfaction. It is the plane of "fair dealing." A few thoughts may aid us to reach this plane.

Summarizing some of the ideas already expressed, let the buyer suit his exactions to the necessities. Let him not demand the impossible or even the unnecessary. Contract obligations should be respected by both buyer and seller and should be so written as to be fair to both. All orders and contracts should be as brief as law and sense

*A paper read at the Pittsburgh meeting of the American Iron and Steel Institute, October 25, 1912.

†Assistant to vice-president Jones & Laughlin Steel Company.



DINNER OF THE AMERICAN IRON AND STEEL INSTITUTE, HOTEL SCHENLEY, PITTSBURGH, PA., FRIDAY EVENING, OCTOBER 25, 1912.

will allow. The best firms today usually have the simplest forms. Never, however, should clearness be sacrificed for brevity. One of our famous editors of years ago gave orders to his force concerning certain words that must never appear in his paper. The buyer of today should issue similar instructions regarding the use when writing orders of short-cut phrases like "as usual" and "same as before." Such terms should never appear on orders. If necessary to refer to previous details, the reference should be specific, not general.

In meeting buyers the salesman is usually the manufacturer's representative and much effort has been put forth to educate the young salesman. The importance of the salesman's training is self-evident, as an inexperienced salesman will oftimes do more harm than the proverbial "bull in a china shop." The buyer also needs special training. If it is wise for the salesman to know how what he sells is made and to be used, it is as wise for the buyer to know not only how what he needs is to be used, but in a general way how it should be made.

Suggestions to the Manufacturer

There are several suggestions to be borne in mind by the manufacturer. Quality is of pre-eminent importance. No high-grade concern can afford a reputation of deliberate inferiority. There may be different grades of material, but, given the grade, no manufacturer should be satisfied except when making quality equal to any of the same grade.

Then there is the element of efficient service. In many products of America the tonnage figures are almost awe-inspiring. Satisfactory and efficient work in filling orders is of prime importance, and it is being learned that efficient service can be rendered without sacrificing production. As time goes on this will be more and more possible, particularly as buyer and seller become better acquainted with each other's needs and limitations.

Buyer and seller are after all a species of Siamese twins. One cannot exist long without the other. They are as necessary to each other as labor and capital. Just as surely as labor cannot exist without capital, or capital succeed without labor, so surely are buyer and seller dependent on each other. Much advantage to both can be gained by a mutual knowledge of the real conditions governing the requirements of the buyer on the one side and on the other the limitations of the seller or maker, in meeting these conditions in a commercial way.

Matters are at their best when buyers are content and manufacturers busy. The strongest factor to bring about and maintain such conditions is "fair dealing." The best buyers today are square in their dealings, and continued success for a manufacturer can only be achieved by maintaining a like attitude.

Thus from either standpoint it can be demonstrated that "honesty *is* the best policy." With this great principle ever before us, let Fairness be our watchword, Efficiency our aim, Perfection our goal.

The Technical Training of Salesmen*

The Carnegie Steel Company's Plan for Making the Selling Force Acquainted with Iron and Steel Works Processes

BY J. M. CAMP.†

It is my privilege to bring to your attention the school recently established by the Carnegie Steel Company for the training of salesmen along practical lines. It was long recognized by the officials of this company that the salesmen in the field did not have the necessary first-hand knowledge of the processes of manufacture of the various products they sold; but the desultory and unsystematic efforts that were made to remedy this condition were, needless to say, without avail.

In the past, when a salesman showed an inclination to broaden his learning or to specialize along some particular line, the usual procedure was to bring him to this district and let him roam at will through the works or mills that particularly interested him, without, as a rule, any person to guide or instruct him. The mill officials were too busy, and information gleaned from the mill employees must be taken with a wise discrimination, as you all know. The results of this procedure were so unsatisfactory and the need for a better plan was so apparent that in the summer of 1911 the president of the company appointed a committee to report upon a more feasible means of carrying on, in a broad and systematic manner, this educational work.

The School for Salesmen

In the effort to solve the problem, an experimental school for salesmen was established, a school that with the experience of one year now rests upon a firmly established basis. It is not a school to teach salesmen how to sell; none but salesmen should be employed for that purpose. The school is designed to show the salesman how iron and steel and their products are made, to familiarize him with the material he sells, to illustrate to him the painstaking care that is continuously being exercised in the various processes of manufacture in order to insure a commercial product of the highest quality, to show him wherein his product excels that of his competitors, and to furnish him convincing arguments that such is the case. The school is made up of salesmen gathered together from our agencies in all parts of the country. As practically all of these men are without technical training, the course must of necessity be made as simple as possible, giving the theoretical side of the various processes of manufacture in the plainest language in order to insure understanding.

An Acquaintance with Raw Materials

A brief description of our activities may be of interest. The greater part of the time is spent in the furnaces and mills of the various plants of the company. The first few days are devoted to the general principles of the manufacture of iron and steel, with a study of metallurgical and chemical terms in order to familiarize the student with their uses. Following this comes a treatise on the foundation of the industry, the Lake Superior iron ores, giving a description of the commercial grades, the different ranges, with particular attention to the Mesaba field from which the greater part of our product is derived. The differences in the three types of mining—open cut, milling and underground—are shown and the distinction between basic and Bessemer ores is made clear. Attention is called to the difficulties of securing ores of constant composition, owing to the variations continually being met in the same mine, how important this uniformity is to successful furnace operation, and how these variations are being overcome, as best they may, by combining the ores from the same and different mines to make up the furnace burden. Then comes a study of transportation—the loading of the boats, their movement to the Lake Erie ports, and the transfer of the ore to the cars and from the cars to the furnace bins or stock yard.

After this comes a study of the actual process of coke making, one day being devoted to the beehive process as illustrated in the most modern plant of its type in the Klondike region, followed by a day at our by-product plant at Farrell, Pa. Next the subject of limestone is covered by a short treatise showing the location of the quarries, the distinction made between stone for the various metallurgical processes, and the importance of a uniform, and preferably low, silica content.

Blast Furnace and Steel Works Operation

Now, with the necessary raw material on hand to charge a blast furnace, we are ready to build and operate one, and the next few days find us studying the construction and operation of the furnace by means of lectures and descriptions from the best textbooks on the subject, alternating

*A paper read at the Pittsburgh meeting of the American Iron and Steel Institute, October 25, 1912.

†General sales department Carnegie Steel Company.

study with the practical operation of the furnace. We finally build our furnace—foundation, crucible, bosh, stack, top and hoist, downcomer, dust catcher and stoves. We follow the charge through the furnace, note how the ore is reduced, melted, drawn off into ladles for transportation to the mixers, and the disposition of the by-products; how the slag is tapped off and granulated for use in cement making, or sent fluid to the dump and there broken up and screened for its various uses; how the gases are utilized under the boilers, in the stoves, or washed and scrubbed until cleaner than the natural air, for use in the internal combustion engines.

With the mixer full of molten iron we proceed to the conversion of the iron into steel by removing all or part of the undesirable elements present. This involves the study of the well known processes, followed by a consideration of the electric and the duplex methods. Taking up the Bessemer process first, we alternately study and inspect this process until the principles are thoroughly understood. There is a marked advantage in alternating the reading with the inspection of a process; the men are not so wearied, coming fresher to the attack, and the understanding is quickened.

Following the Bessemer process, both acid and basic, we take up the open-hearth process. At a plant so well equipped with open-hearth furnaces as the Homestead works, we can find furnaces almost at any time in every stage of reconstruction, thereby enabling the students to watch the work of rebuilding; if need be, to enter the furnaces, regenerative chambers and flues, and thus become familiar with their construction. The charging of the furnaces is observed—limestone, ore, scrap, followed later by the molten pig iron—and the heats are boiled down, tapped, recarburized, teemed into the ingot molds, and the ingots stripped and sent to the soaking pits preliminary to rolling. The electric and duplex processes are taken up. The advantages of steel made by the former process for special purposes are shown, and the many forms of duplexing are studied together with the special adaptation of each for its purpose or environment.

Rolling Mill Processes

With the completion of the study of the various commercial processes for the manufacture of steel, we take up rolling mill work and our time for the next few weeks is spent continuously in the works of the company, the greater part of the time being consumed in the larger works, most typical of the processes. It is the purpose, however, to spend a short time at least in each of the principal plants. At these the students take note of everything they see. All the doubtful points are explained to them—the manner of heating, type of engine, style of mill among the many forms that exist, giving particular attention to the finished product. Instances are known where men for years had been selling a product they had never seen.

The points to which particular attention is directed with regard to finished material of all kinds have been carefully compiled, being added to from time to time, and they make interesting reading. At several of the works one or more of the practical mill men are delegated to give a talk to the students, strictly from the mill standpoint, showing the limitations and possibilities, illustrated by examples of rolling mill work on hand, bringing out and emphasizing the importance of furnishing exact data to the mills at all times. These talks have met with great favor, and it is proposed to extend them to include other mills.

Laboratory Methods

After we have become familiar with rolling mills and rolling mill products, we take up the study of the elements entering into the composition of steel, of chemical and physical testing and of defects in material. Naturally the chemical testing should be done as soon as the steel is made and previous to rolling. I have placed it here for convenience only. In the study of the effects of the elements entering into steel, we take into consideration both ordinary and alloy steels, including all commercial steels of the day. After this, our time is spent in the chemical and physical laboratories—in the former watching the routine methods of analyses, not with the expectation of becoming chemists while we wait, but rather of learning how carefully the raw material is scrutinized before it is used, and the watchful care that is continuously exercised to keep the product up to the standard. Usually a copy of the method of analysis is given the students beforehand in order that they may follow better the analyses as they are being made. In a physical testing laboratory, such as we have at the Homestead works, where all manner of testing is being done at all times, we soon become familiar with the different processes, the preparation of the tests, hot and cold bending, measuring and recording the stress when pulling, with the necessarily quick and accurate calculation by aid of the slide rule.

It is at this stage that the attention of our students is directed to the ills to which steel is subject, due to both chemical and physical causes, their attention, however, having been called to these faults, whenever and wherever apparent, in our previous wanderings in the mills. Since examples of faulty steel are not always to be had when wanted, specimens illustrating the common and special faults have been accumulated, to which additions are being made from time to time as opportunity arises. These are exhibited to the students, and upon them explanatory talks are given.

Special Products

The next subject in our course is special products—methods of manufacture and properties. This includes a growing list of subjects usually handled by men specially trained for the particular purpose. It is readily apparent that the specialty of today may be the everyday appliance of tomorrow, making room for new specialties. It is our aim to anticipate this tomorrow by making the agents all equally familiar with the subjects. Among these specialties are steel wheels, gear blanks, axles, sheet piling, mine timbers, vanadium and other alloy steels.

In studying steel wheels, the students, having seen the steel made, follow the ingots from the soaking pit to the rolls. Attention is called to the enormous reduction from the ingot to the finished round from which the wheel blanks are cut, the high discard to insure freedom from piping, and the careful inspection and chipping of the blanks preliminary to shipment to the wheel works. Here the entire course of manufacture is carefully studied; how the blanks are weighed, carefully heated, the heat being restored at the different stages; forged to the approximate shape; the core punched out; the wheel rolled to a finish; coned; stamped with the identification marks; set aside to cool; the preliminary inspection made, followed by the requisite machine work, and the final rigid inspection of the finished wheel before shipment. With all this before them, metallurgically and mechanically, so perfect in all its details, the pride in the product and the argument that accompanies it are apparent.

In similar manner the manufacture of the remaining special products is studied and their relative merits developed—axles and heat treatment to develop their best properties, hot versus cold worked splice bars, etc. In the case of the majority of these specialties men trained along the particular line give the students discourses embodying the fruits of their knowledge based on long experience.

Discussions and Reports

Upon completion of our studies in the mills we take up and follow the path of orders through the city office, then to and through the mills. Our purpose is to impress upon the students, so as to be remembered when they return again to their fields, the importance of properly dressing their orders, and how necessary it is to the office and mills that their orders should be specific, concise, correct, with all the data at hand as to how our customers want their material, how they treat or handle it, and what use they make of it.

At every step the students are expected to take notes, and upon completion of the study of the particular plant or process to assemble in the evening and discuss the subject. Here ideas are exchanged, disagreeing viewpoints are argued and settled. And finally when the heat of discussion has cooled, the students write up collectively one description of the subject. This, upon presentation to the writer is gone over carefully with the students, and if satisfactory, covering the salient features and indicating that the proper thought and time have been given it, it is approved and typewritten. Copies are given to each of them for insertion in their binders, or, in the majority of cases, a more complete description is substituted for it. If the description is not satisfactory, something that rarely happens twice to a class, it is returned to them to be done

over. At the end of the course, by this procedure, each member of the class carries away with him about 200 pages of very valuable and highly prized notes, maps and tables.

Examinations and Standings

Last but not least in importance is the test to determine how much of these notes that may be carried under the arm are also lodged in the head, where they can be of most service. There follows the examination period, equally dreaded with the examination days of our school or university life. It is a written examination consuming about five days, with a few days preceding devoted to review, and may include any subject in the course. It is essential that there should be an examination. Aside from the question it answers, "Are our efforts bearing good fruit?" the examination has proved a potent, and in one or two instances a necessary, stimulus to endeavor, keeping the men on their mettle throughout the course. The relative standing of each man as developed by the examination is given to him and him only, and this result he is expected to transmit to his chief. Any further diffusion of his standing rests with these two. Naturally it is the aim of the next man from the same office to break this record and the result is a continuous incentive to labor.

Twenty-five Carnegie Salesmen Have Taken the School Work

In this the latest move for "increased business efficiency" the results, so far as can be seen from our first efforts, are extremely gratifying both to the students and to the officials of the company. Twenty-five salesmen have completed the course and returned to their stations with a new and broader understanding of their duties. At the beginning of the work, the men selected for the class took up their duties with seeming, and in several instances pronounced, reluctance, as if it were a disagreeable medicine that had to be taken. Now it is a privilege eagerly sought for, and we have a fast-growing waiting list for future classes. In this educational work we are still young. The field is entirely new. We are but feeling our way. Suggestions are eagerly sought for. Improvements are continuously being made. And it is our hope that ere long we will be proud of our school for salesmen.

Discussion

By Eugene P. Thomas, President
United States Steel Products Company

A few salesmen are born, most of them are made, and some attention must be devoted to the making. Setting aside the possibility of genius, it is certain that it requires more than casual bonhomie, fluency of expression and elementary study of goods to make the most successful salesman. Mr. Camp has ably described for us a system instituted by the Carnegie Steel Company to give salesmen as thorough a course in the various steps in the manufacture of steel as is possible in the necessarily limited time which the course is designed to cover. Valuable as such a course is to a man pursuing its study seriously, it cannot supply that more effective training only to be acquired by actual work in the mills; work undertaken either as a means of livelihood or for the experience and training it affords.

Training Acquired by Mill Experience

As supplementary to Mr. Camp's admirable paper I purpose to indicate some of the relative advantages of training such as the Carnegie course provides and of training acquired by actual mill experience. It is strongly indicative of the present and future demand for salesmen with better technical equipment that some of our large manufacturing companies should be giving serious thought to the problem of scientific selling as opposed to the haphazard methods not infrequently employed by those with a cursory knowledge of mill conditions, processes and equipment. As James A. Farrell said in his paper at the 1910 meeting of this Institute: "Good salesmanship and sound business principles in the conduct of the selling of iron and steel are just as essential and vital to the prosperity and continued success of the industry as low costs and up-to-date machinery and manufacturing practice."

Granting the necessity, therefore, for more advanced methods of training salesmen, it is of interest to learn what steps are being taken by the members of this body to satisfy present needs for efficient salesmanship and the future demand for selling ability in keeping with the advancement in the art of manufacture. The old days, when steel making was in a more experimental stage than at present, permitted the salesmen of a suave and ready type to cleverly evade a technically accurate reply to the questions of the buyer; but the buyer has been rapidly educated by the technical press; by the information acquired from the limited number of engineer-salesmen or experts direct from the mills; by the fact that a large percentage of the clientele of steel manufacturers are themselves manufacturers of collateral lines, or engaged in industries or industrial pursuits which demand exact and thorough knowledge of the materials employed, from the standpoints of economy, efficiency and safety.

Classification of Iron and Steel Salesmen

Iron and steel salesmen may be roughly classified in three distinctive types: 1. The usual salesman, evolved without mill experience or technical training from the office man. 2. The more efficient class who have had as a basis for their work a technical course either in an engineering school or such as Mr. Camp has described. 3. The ideal type best equipped for salesmanship who, with or without the foundation of a technical course, has actually gone through the mill.

The first of these, the office graduate, results from the ordinary practice of transplanting men from some other vocation where they may or may not have been successful as salesmen, or transferring them from other office departments to the selling end. This ordinarily means that they must acquire experience at the expense of the manufacturer or the customer. Occasionally painstaking effort is made by such salesman, without the aid of his principals, to acquire some technical knowledge. He may even obtain eventually a fair superficial knowledge of materials, without having been actually engaged in their manufacture. That extra energy and unusual study are necessary to obtain such knowledge is sufficient to deter many from going thoroughly into the subject; they will rather rely upon facility in concealing their lack of mill experience, and upon their skill and shrewdness in handling their customers.

The value of the man with some technical training, as distinguished from that of the preceding type, increases in proportion to the distance of the salesman from the mill and the facility of communication. Far afield, where weeks may be consumed in referring technical issues to the mills, some engineering knowledge is frequently a necessity; whereas, to the man able to obtain replies from the mills within a few hours, engineering knowledge is not by any means so essential. This knowledge is useful to the salesman in many ways; he occupies the position between the buyer and the mill, which often means that he is the intermediary between the engineer in the field and the engineer at the works. Such a salesman commands a higher degree of respect from the buyer than the one who has to refer all questions involving technical details to the mills; his representations carry more weight with the purchaser and he is able to bring to the buyer's attention in personal discussion in a way not possible to a man without technical training, special features of the material he is selling. He is not only capable of suggesting to and convincing the buyer of the advantages of modifying his specification to comply with standard mill practice, but being in personal touch with buyers and knowing the requirements of the market, he can often suggest to the mill changes in their standard product, the desirability of which would perhaps not otherwise be apparent from the mill standpoint.

The Ideal Salesman with Mill Experience

These advantages which attend the second type, or engineer-salesman, are present, but in greater degree, with the third type, the ideal salesman who has actual mill experience at his command. The young man who has had a training of years in the mills, foundries, machine shops, laboratories and other departments of the steel industry; who has taken advantage of his opportunities; who, in recognition of ability, is taken into the office and subsequently made a member of the selling staff, should, with due regard to the personal equation, become a capable salesman. If he has the elements of ambition and energy in his makeup, with the aid of superiors who are closely watching the development of their men, the young work-

man should develop, if transferred from one department to another, until he obtains a comprehensive experience which will fit him either for the higher technical and mechanical positions or to become that most satisfactory of salesmen, a technical expert.

The mental discipline of such a severe course of training is invaluable, even without acquired scholastic knowledge. The history of many who are eminent in the steel business confirms this statement. Others have become efficient in the art of selling and yet have had a continual uphill struggle against the disadvantages due to a lack of inherent knowledge of manufacture only to be acquired by years in the mills. There are few classes of steel products in which at some time there does not arise some question of strength, chemical composition, corrosion, wearing qualities, etc., involving metallurgy, chemistry, civil or electrical engineering. Advantageous features of competing products are often brought forward by buyers, involving questions of engineering or technicalities of manufacture, and the salesman with adequate mill experience should be capable of grasping at once the point at issue, which may determine the award of the contract. The engineer-salesman can discuss intelligently with the purchaser the finer points involved in the manufacture with a degree of authority which the mere salesman lacks. He has more confidence in explaining the merit of his product or in refuting the claims or meeting the disparagements of competitors.

Aiding the Most Capable of Mill Men

Of the thousands of young men going into the mills yearly it is reasonable to suppose there are among them some who may develop into commercial geniuses whose success will rival those of the past. While some of these young men may forge ahead unassisted, save by their own energy, it is worth while to consider ways and means by which those most capable may be aided; there can be no question that assistance given in overcoming initial difficulties will be amply repaid by future achievements, either along mechanical lines or in salesmanship to which their abilities may tend. Mr. Camp deals with a system devised to give the ordinary salesman a rapid preparation in technical details which is a long step in the right direction. It is not to be assumed, however, that even the most intense application and earnest study for five or six weeks can be as effectual a training as an equal number of years spent in the actual manufacture in the various departments of the industry. In this connection attention may be directed to the system employed by some large engineering companies, i. e., engaging for a portion of their actual working force young men with prior technical training, with the idea of passing them by degrees through the plants until they are finally turned out as expert engineer-salesmen.

The purpose of this discussion is, therefore, to deprecate the practice of recruiting sales-department forces from the casual applicant and to favor recruiting them from graduates of the mill (with some regard to their primary or acquired education) after they have passed through the necessary stages, either as a result of a carefully planned mill course or of their own initiative.

These engineering or technical salesmen, as they may be termed, are as important to the future of the steel industry as any other element. They are men who by their years of experience in the shops, mills and laboratories have acquired an intuitive appreciation of accuracy, the habit of using their brains, of devoting concentrated thought even outside of business hours to matters of moment, whether of a technical or business nature. They are inclined from mechanical experience and systematic routine to arrange the facts or sequence of events in negotiations in logical order, assigning to them their relative importance, sub-consciously utilizing the mental discipline acquired during their technical training. Such equipment enables them to win trade not solely by the exercise of persuasive ability or good fellowship (factors which become less potent as buyers acquire technical information almost equally requisite to intelligent purchasing), but by exact and intimate knowledge and the accuracy and facility with which they can answer any question relating to manufacture and quality which the most experienced and critical customer may propound.

Use of Mayari Iron in Foundry Mixtures*

Preparation and Use of the Ore in the Blast Furnace—Chilling, Tensile, Transverse, Hardness and Machining Tests of Castings

BY QUINCY BENT†

The Mayari ore deposits of Cuba have furnished a wide scope for experimental work in the processes of manufacture and products of both iron and steel. The ore itself is rather unlike any other iron bearing mineral in common use. A serpentine rock, decomposed by the action of salt, water and heat, leaves on the plateau a bed of soft ore ranging from 12 to 30 ft. in depth. The ore is quite uniform in analysis, save for a slight variation in nickel content and in the amount of silica and alumina; careful mining, however, produces a practically constant ore.

An analysis of the natural ore is given in the following table:

Table 1.—Analysis of Mayari Ore and Nodules.

	Ore.	Nodules.
Iron (natural) per cent.	36.5	53.5
Iron (dry), per cent.	50.34	54.9
Silica, per cent.	3.75	4.00
Alumina, per cent.	10.00	13.00
Phosphorus, per cent.	0.010	0.015
Sulphur, per cent.	0.18	0.18
Moisture, per cent.	27.5	2.5
Combined water, per cent.	10.5	...
Manganese, per cent.	0.64	0.85
Chromium, per cent.	1.40	2.10
Nickel and cobalt, per cent.	0.72	0.95

The ore in its natural condition is very similar to a loose clay, not having, however, the plasticity of a clay. We have used this raw ore in all proportions up to 75 per cent., but better results have been so far obtained from a treated material.

Nodulizing, briquetting and sintering are all available processes for preparing the ore in desirable forms. The first of these is the method at present most largely employed, recommending itself to us on account of our previous experience with it in the preparation of Cornwall concentrates. The nodulizing kilns are 125 ft. long, of 10 in. diameter, and have a capacity of about 8 tons of finished product per hour. Powdered coal is used as a fuel, about 400 lb. being required to produce a ton of nodules.

These nodules analyze as given in the accompanying table. A typical sizing test yields remainders on screens as given in the second table:

Table 2.—Size Test of Nodules by Percentage Passing Through Different Screens.

On ¾ inch.	4.25 per cent.	On 30 mesh.	12.25 per cent.
½ inch.	4.75 per cent.	40 mesh.	7.50 per cent.
¼ inch.	7.50 per cent.	60 mesh.	6.75 per cent.
⅛ inch.	13.75 per cent.	80 mesh.	2.00 per cent.
10 mesh.	9.00 per cent.	100 mesh.	1.50 per cent.
20 mesh.	29.50 per cent.	Through 100 mesh.	1.25 per cent.

They are easy to handle in grab buckets, bins and chutes; do not carry enough moisture to give trouble in cold weather and are well suited to blast furnace requirements.

The briquetting of Mayari ore has presented unique difficulties, in handling the material its sticky quality mak-

*Paper read at the Pittsburgh meeting of the American Iron and Steel Institute, October 25.

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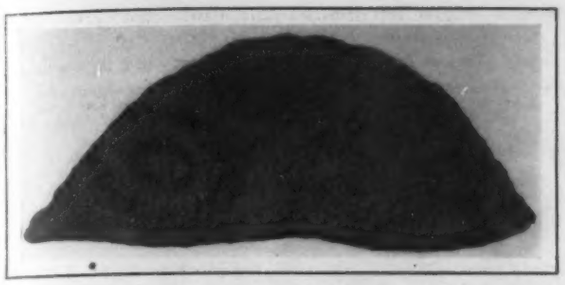


Fracture of Ordinary Pig Metal

ing it hard to fill molds and to free the chutes and dies. It also has a peculiar quality of preventing the progress of heat through its mass. Bricks of small dimensions may be thoroughly fused on the surface, yet remain practically unaffected at the center.

Sintering is entirely successful with Mayari ore and probably will ultimately be found more satisfactory than nodulizing. Its advantages are the smaller amount of fuel required and the more open and porous character of the material produced.

Mayari Ore in Blast Furnace Practice

The first problem that confronts the furnaceman is perhaps the burden of 75 to 100 per cent. of nodulized material. Experiments, five to seven years ago, on nodules from Cornwall concentrates, proved conclusively that nodules *per se* need involve no insurmountable difficulties. The furnace seldom or never slipped, made a minimum of flue dirt (2½ per cent.), evidenced no marked increase of blast pressure and produced a good daily output on a fuel ratio of about one to one. Considering the results of these experiments, both from the furnace experience and from our knowledge of nodulizing, it was decided to put Mayari ore into the form of nodules.

Block of Chilled Mayari Pig Metal

You will note the analysis of the nodules—4.00 per cent. silica, 13.00 per cent. alumina, 54.9 per cent. iron. A few minutes calculation will convince the metallurgist that no ordinary blast furnace slag equation is before him. Artificial mixtures, using bauxite as the alumina bearing material, were made up. The chemistry of the ore was imitated and a blast furnace run on it for several weeks. A general impression seemed to prevail that somewhere above the 20 per cent. alumina mark was a range of dangerous territory in furnace slags. We have found little to fear in all of the scale of Al_2O_3 content from 10 to 32 per cent., our fluxing guide being SiO_2 plus Al_2O_3 to CaO plus MgO, regarding the Al_2O_3 as an acid.

We have operated furnaces with all percentages of nodulized Mayari ore; have made continuous runs for months with 100 per cent. of it in the furnaces. The furnaces very seldom slip or hang. They do have a tendency to high pressure and consequently slow driving, which I believe is due to the chemistry of the gangue before it fuses with the flux, an operation which takes place rather high up in the furnace bosh. The quality of the iron produced is extremely regular and the fuel ratio good. A peculiar feature of this iron is its low silicon, due to the lack of SiO_2 in the furnace and to its desire to make as respectable a showing as possible in the slag rather than to be reduced.

I give herewith typical analyses of irons and slags on 50 per cent. Mayari and 50 per cent. Cuban hard ore and 100 per cent. Mayari:

Table 3—Typical Analyses of Iron of Mayari Ores.

Irons: 50 Per Cent. Mayari and 50 Per Cent. Cuban Hard Ore.

Si.	P.	S.	Mn.	Cr.	Ni.
0.47	0.049	0.020	0.70	1.82	0.76
0.21	0.050	0.031	0.57	1.66	0.77
0.55	0.051	0.056	0.69	1.68	0.77
0.44	0.049	0.028	0.62	1.77	0.75

Slags: 50 Per Cent. Mayari and 50 Per Cent. Cuban Hard Ore.

SiO_2	Al_2O_3	CaO	MgO	S.
24.44	21.30	39.99	10.76	2.53
25.52	21.54	38.13	11.28	2.43
24.42	21.72	35.01	10.62	2.02
19.30	20.75	42.00	14.70	2.17

Irons: 100 Per Cent. Mayari.

Si.	P.	S.	Mn.	Cr.	Ni.
0.85	0.055	0.018	0.97	2.61	1.49
0.77	0.048	0.020	0.89	2.92	1.52
0.82	0.047	0.027	0.76	2.92	1.51

Slags: 100 Per Cent. Mayari.

SiO_2	Al_2O_3	CaO	MgO	S.
18.40	29.59	38.25	10.68	1.90
19.24	29.84	32.51	14.72	1.75
17.80	29.67	35.65	14.27	1.79
17.03	29.92	33.23	17.07	1.74

As far as we can learn from comparative observations, the temperature of the hearth, and consequently of the iron and slag, is somewhat higher than that of the normal blast furnace on Bessemer iron. This impression would seem to be substantiated by the fact that there is a reduction of TiO_2 taking place within the furnace, throwing a percentage of titanium into the iron, varying with the amount of silicon present. The following table shows this relation:

Silicon.....	0.22	0.47	0.80	1.50	1.80
Titanium	0.05	0.15	0.18	0.25	0.30

This Mayari pig iron has a large crystalline structure somewhat similar to spiegel, is hard and brittle, cannot be drilled and breaks up considerably when handled. The fracture is, of course, influenced by the rate of cooling, but even sand cast pigs have very little of the granular structure, unless the silicon is abnormally high. The iron runs freely, leaves little skull in the ladles and has a clean sharp cut surface.

Another peculiarity of the iron is the high total carbon content and the high ratio of combined to graphitic carbon, this ratio depending upon the rate of cooling, but in our iron the chromium seems to have the tendency of combining the carbon and prohibiting the formation of graphitic carbon.

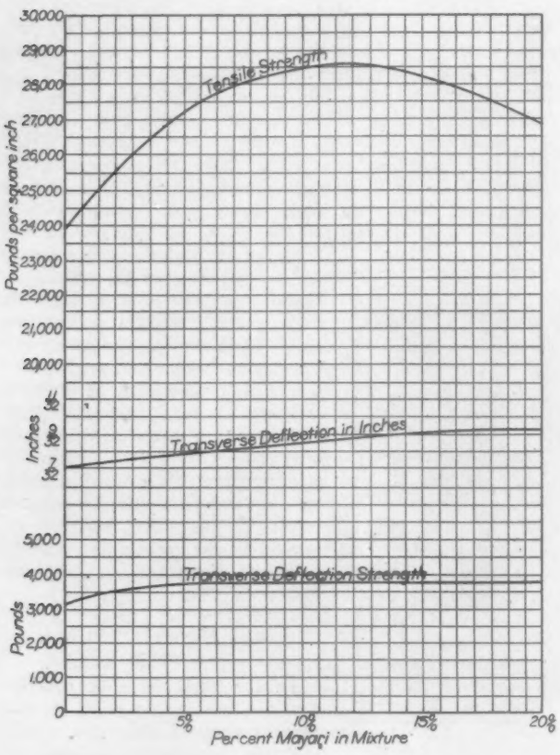
Use of Mayari Iron in Iron Castings

In the early days of production of Mayari pig iron, it was thought that its only use would be in the manufacture of steel, its inherent qualities prohibiting its use as an iron. A certain element of fortune, however, led us to discover our mistake. A portion of our blast furnace iron was taken direct each day to the foundry and as the Mayari burden was put on the furnaces some of this mixture found its way into our foundry metal. In it we noticed several peculiar qualities; namely, the smooth appearance of the surface, the closeness of the grain structure, the thin sharp edges, and withal the strength which the fins on the castings seemed to possess.

These features led to experiments in crucible mixtures, which, in turn, brought us to use the metal in our general

Fracture of Mayari Pig Metal

foundry practice. In the meantime, the content of nickel and chromium in the iron had attracted the attention of other iron users and we began to hear of surprising results from certain foundries manufacturing pipe balls, guides, etc. A little later the roll manufacturers, who had been experimenting with chrome-nickel alloys, undertook the problem of using it in their mixtures. While all this was taking place, we were working in our foundry, changing the proportions of the mixture to get certain results and reproducing results by week and month intervals of changes. From our machine shops came favorable comments on the machining qualities of the iron and the nature of the resulting surfaces. Several times we have gone off the mixture entirely to assure ourselves that it was the Mayari iron and not some other element that had caused the change, but each time the same results appeared.



Tensile and Transverse Tests of Mayari Cast Bars

There are so many combinations of features or possibilities, and the time has been so short to investigate all of the iron's qualities, that I feel somewhat of a hesitancy in placing before you so unfinished a history. Having gone into the outline of the manufacture of the Mayari metal and connected this with its use in the foundry, I will try to bring you into closer touch with some of the details of our investigations.

Our first inquiry introduces us to the effect of Mayari iron (and by Mayari iron I mean, throughout this paper, iron with 2 to 2.50 per cent. Cr. and 1 to 1.25 per cent. Ni., the chromium being always approximately double the nickel) in varying percentages on the grain of ordinary foundry mixtures. Wedge-shaped pieces 6 in. at the base, tapering to a point in 2 ft. of length, were cast in green sand, great care being taken as to the moisture of the molds and their compactness; also as to the temperature of the iron mixture. These specimens were split open and the fracture examined under the microscope; a unit grain size was arbitrarily chosen and its position located in each of the castings. From these locations of unit grains, as measured from the point, we can distinguish the difference in grain structure due to the presence of Mayari iron.

The closing of the grain of a foundry mixture is so intimately related to its chilling characteristics that our next test was with chilled blocks from the same mixture percentages, care again being taken to have approximately the same pouring temperature. These blocks were cast in

Table 4.—Wedge Tests Made from Seven Experimental Heats, Using Different Percentages of Mayari Iron

(Wedges Cast in Sand, 6 in. at base and tapered in 2 ft. to a point.)

Per cent. Mayari iron	Temperature of iron mixture	Portions of equal size grain measured from the point
0	2714	4 in.
5	2696	4 in.
10	2714	4½ in.
20	2696	6 in.
30	2696	6 in.
40	2696	7 in.
50	2696	9 in.

green sand against a 2-in. chill, the block being 4 x 4 x 6 in.

The chill depth was accurately measured under the microscope and hardness tests were made on the chill surface and also down the face of the fracture. The depth of chill shows plainly the influence of the Mayari addition, as does also the hardness test on the chilled surface.

Table 5—Chill and Hardness Tests Made from Seven Experimental Heats Using Different Percentages of Mayari Iron

(Per cent. of Mayari iron and temperature of iron mixture)

	0	5	10	20	30	40	50
	2714	2696	2714	2696	2696	2696	2696
Chill, in.	0	¼	½	1	1	1	1
Brinell:							
Face	182	182	186	200	232	239	246
1/16	170	178	182	195	232	239	246
⅛	170	178	182	209	226	232	239
¼	167	178	182	209	226	232	239
¼	167	178	182	209	220	232	232
¼	158	178	178	209	214	232	232
¼	158	161	174	190	209	226	214
¼	158	164	170	186	182	204	214
¼	155	164	170	195	182	190	209
¼	155	167	167	186	178	190	209
¼	147	161	167	167	178	186	190
¼	144	155	164	167	178	186	186
¼	132	155	161	167	178	186	195
¼	126	155	161	158	178	186	195
¼	126	155	161	158	174	182	200
Aver.	152	166	171	186	197	207	214
Scleroscope:							
1/16	38	40	45	46	47	48	49
⅛	38	40	45	46	47	48	48
¼	38	40	45	46	47	48	47
¼	38	40	45	46	47	48	47
¼	38	40	45	45	47	48	47
¼	37	38	45	45	47	48	47
¼	37	39	45	45	46	47	47
¼	36	38	45	45	45	45	46
¼	35	38	44	45	45	45	46
¼	35	37	44	44	43	45	45
¼	35	36	44	44	43	45	45
¼	35	36	43	43	43	45	45
¼	34	36	43	41	43	45	45
¼	34	36	43	41	43	45	45
Aver.	36.2	38.1	44.3	44.4	45.2	46.3	46.3

NOTE.—Tests made on 4 x 4 x 6-in. blocks cast against a 2-in. chill block. A hardness test was made on the chilled surface and at distances down the face of the fracture, first 1/16 in. down and then at distances or intervals of ¼ inch, as indicated in the table.

Having discovered the capability of Mayari iron to produce a close grain and also a chilling mixture, we would naturally turn to the influence which it might have on the strength of the casting as evidenced by the tensile and transverse tests. An accompanying diagram shows these curves. The figures are the average of several hundred tests, all made according to the American Society for Testing Materials method. The bars were cast from our regular foundry melts in actual practice.

One notes the rise in tensile until the crux is reached and then a decline as further additions are made. The same rise is apparent in the transverse strength and at approximately the same point in the scale, although there is a second rise after the Mayari percentage passes 20; this, however, is not shown on the diagram attached.

From the foregoing data, it is quite evident that about 10 per cent. would be a fair addition for general foundry work, increasing the amount as emphasis is to be laid on closeness of grain or chill. In an accompanying table are given the results of our foundry practice for several months and also for a period when we omitted the Mayari iron to see the change in figures and to check the accuracy of our opinion that the Mayari addition was beneficial.

So far I have not considered one very important feature, namely, the machining characteristics of the mixture. To demonstrate this, we had cast by two outside foundries, well known in the general machinery trade, solid cylinders 12 in. long and 6 in. in diameter. These were cast in green sand and were of their heavy casting mixture. Arbitration test bars were also cast at the same time, six cylinders and 36 bars coming from each foundry. These cylinders were placed in a lathe and the

Table 6—Summaries of Monthly Records of Regular Foundry Tests on Cast Iron

10 Per Cent. Mayari Iron Used

Date	Deflection, in.	Si.	S.	P.	Mn.	C.C.	G.C.	T.C.	Cr.	Ni.	Tensile test, lb. per sq. in.	Transverse test, lb.
April, 1912	8/32	1.85	0.115	0.605	0.73	0.55	2.84	3.37	0.43	0.18	29,066	3,327
May 15 to 31, 1912	9/32	1.78	0.139	0.700	0.61	0.64	3.15	3.44	0.21	0.18	26,491	3,300
June, 1912	9/32	1.60	0.132	0.596	0.60	0.76	2.68	3.44	0.32	0.16	29,315	3,420
July, 1912	10/32	1.72	0.128	0.563	0.66	0.67	2.71	3.38	0.37	0.18	28,121	3,354
August, 1912	10/32	1.69	0.152	0.520	0.61	0.76	2.64	3.40	0.34	0.21	28,198	3,459
September, 1912	9/32	1.52	0.152	0.474	0.65	0.74	2.61	3.35	0.37	0.22	29,729	3,473
Average	9/32	1.69	0.136	0.576	0.64	0.68	2.77	3.39	0.34	0.18	28,486	3,388
No Mayari Iron Used												
February 1 to 8, 1912	7/32	1.59	0.118	0.637	0.69	...	...	3.13	...	...	24,335	3,200
April 27 to May 15, 1912	7/32	1.90	0.128	0.624	0.67	0.55	2.83	3.38	...	...	24,694	3,203
Average	7/32	1.74	0.123	0.630	0.68	0.55	2.83	3.25	...	...	24,514	3,201

power accurately measured per unit of machine work. I will not go into the details of the test, but suffice it to say that the tool was sharpened after each test; the cutting speeds were the same, etc. Hardness tests were made on all surfaces and the complete results are here tabulated.

One notes an increase in the power required to machine the Mayari casting, but this increase is not in proportion to the increased strength or hardness. As a matter of fact, a careful canvass of the machinists engaged in everyday machining of Mayari castings developed the reply, "I have noticed no difference between the different castings that come to me." There is, of course, a difference; a close inspection of the tools showed this on our tests, but it is not great, or piecework men would certainly have brought it to our attention.

Table 7—Machining Tests of Iron Cylinders

	10 per cent. Mayari iron	Iron from foundry P	Iron from foundry B
Average hardness (6 specimens)			
Brinell	200	54	102
Average power required to machine off 6 in. in length with ½ in. cut, hp	3.2	2.43	2.73
Tests on arbitration bars, average of 30 tests:			
Tensile test, lb. per sq. in.	29,940	21,050	20,750
Transverse test, lb	3,620	3,220	3,112
Deflection, in	10/32	10/32	10/32
Analysis:			
Graphitic carbon	2.54	2.57	2.55
Combined carbon	0.66	0.74	0.65
Total carbon	3.20	3.31	3.18
Silicon	1.38	2.01	2.42
Manganese	0.52	0.49	0.41
Phosphorus	0.469	0.595	0.755
Sulphur	0.107	0.086	0.108
Chromium	0.42	....	....
Nickel	0.29	....	....

Conclusions:

Brinell hardness of Mayari 270.00 per cent. greater than foundry P; 66.67 per cent. greater than Foundry B.

Power required to machine Mayari 31.68 per cent. greater than Foundry P; 17.22 per cent. greater than Foundry B.

Tensile strength of Mayari 42.23 per cent. greater than Foundry P; 44.29 per cent. greater than Foundry B.

Transverse strength of Mayari 12.42 per cent. greater than Foundry P; 16.32 per cent. greater than Foundry B.

To further check the machining qualities of Mayari foundry mixtures, specimens of heavy-casting iron and Mayari iron were placed in a drill press and drilled; the power required was again accurately measured under identical conditions. These results, as expressed in Table 8, confirm the figures of our preceding experiment, showing an increase in power required to drill the Mayari mixture.

Lack of time has prevented our investigations on relative machining qualities as the size of the casting is increased. Our belief is that as the mass increases less difference will appear. This theory is borne out by 15 subsequent experiments which are not recorded in this paper; the average difference in these instances being 11.6 per cent.

Our natural deduction from the above being not to recommend the iron for all purposes, but for castings where closeness of grain, chill, strength or service is an essential.

Table 8—Average Horsepower Required to Drill Four Holes in Cast Iron with 1¼-in. Drill, Holes 6 in. Deep

Mayari foundry iron	3.04 hp.
Iron from Foundry P	2.27 hp.
Iron from Foundry B	2.36 hp.

Power required to drill Mayari foundry iron is 33.92 per cent. greater than that for Foundry P.

Power required to drill Mayari foundry iron is 28.81 per cent. greater than that for Foundry B.

Amount of Mayari Iron for Different Castings

The qualities of the iron developed in mixtures, as indicated by the tests here reported, have led me to divide its uses into three classes of castings:

1. All chilled castings.
2. Green sand castings or semi-chilled castings.
3. Dry sand castings.

Under the first head are rolls, guides, crusher plates, wearing plates, die blocks, car wheels and all other castings requiring a hard surface for resistance to wear. The amount of Mayari iron to be used depends entirely on the depth of chill required and the severity of the service to which the castings are to be put. Ordinary uses range within 15 to 40 per cent. limits. Our experience with rolls has been most satisfactory, both as to increased life and as to strength and quality of surface. Rolls for both hot and cold work have shown that we can expect an increase from 25 to 50 per cent. in life. Guides have given as high as 100 per cent. increase in service, while reports as to crusher plates, etc., have compared quite favorably with manganese steel.

For green sand work where also a hard surface is required, yet where machine work must be done, leaving a fair and uniform surface of close texture, Maryari iron has given most excellent results. Some of these uses are sand rolls, pipe balls, bending dies, valve bodies, piston rings and shear blades, the percentage of Mayari being from 10 to 30 per cent.

Under the third heading come castings where a fine finish is required or a machined wearing surface involving both strength and closeness of grain, such as engine cylinders, valves, guides, slides, etc. This class of casting requires a Mayari addition of 8 to 15 per cent.

For all of the three classes, we have found it desirable to keep the phosphorus in the mixture about 0.5 per cent.

In general, we say that Mayari iron accomplishes all that can be gained by the addition of cold blast charcoal iron, with better results as far as wearing surface is concerned. It is superior to any steel additions, inasmuch as its shrinkage and contraction is normal compared with ordinary foundry iron; that it does not gain its strength by a decrease in carbon content, as in semi-steel, and finally that it does not have the tendency to chill locally, due to cold or wet spots in the mold.

The nickel and chromium do not segregate either in iron or steel; the nickel seems to have counteracting effect on the chromium as far as brittleness is concerned. A little loss is encountered in the chromium percentage as the mixture passes through a cupola, but the nickel remains unaffected. It is our belief that fluidity of the foundry iron is a little increased; the metal is very clean and a reduction in our defective castings has resulted.

There is present in the iron a small percentage of vanadium and some titanium; how much these elements influence the results of our tests is a matter of conjecture. One would naturally attribute the iron's qualities to chromium and nickel. That our ratio—two parts of chromium to one part of nickel—is the right relation for all purposes is hardly conceivable; only experience can develop all of the changes within the range of possibility.

This paper is written entirely in the spirit of suggestion. The few facts that are known to us are set forth, but it must remain for the future to apply scientifically the iron's characteristic features in proper proportions to meet best the various requirements of an alloy iron.

Ordnance Manufacture at South Bethlehem*

A Description of Methods Employed with 12-Inch Guns, Armor Piercing Projectiles and Hard-Faced Armor Plate

BY E. G. GRACE†

The modernization of the armament of the United States, which had been permitted to fall behind that of the European nations for a quarter of a century, took concrete form in 1886. At that date our country was without facilities for making steel gun forgings or armor plate of the requisite size and quality, so the United States Government determined to encourage the establishment of permanent domestic sources of supply by procuring the gun forgings and armor from private manufacturers, but decided to assemble and finish the guns at its own factories. Therefore, the Navy Department, in the year 1886, for the first time invited manufacturers in the United States to propose on the furnishing of about 1300 tons of gun forgings and 4500 tons of steel armor plate. The Cambria Iron Company, the Midvale Steel Company and the Bethlehem Iron Company (our predecessor) offered to furnish the gun forgings, and the Cleveland Rolling Mill Company and the Bethlehem Iron Company offered to furnish the armor.

Bethlehem Enters the Armament Field in 1887

The Bethlehem Iron Company's proposal for both gun forgings and armor was accepted in April, 1887, at which time the company, forecasting the future, and desiring to be pioneers in this particular branch of the iron and steel industry, already had under way the erection of a plant for producing not only the gun forgings and armor but finished guns as well. Similarly, in 1889, the Bethlehem Iron Company secured the first large order from the United States army (War Department) for steel forgings for its guns, and with the acquirement of these two orders for gun forgings and the order for armor plate the company entered into the first stage of its career as manufacturers of ordnance.

An Order in 1891 for 100 Guns of 8-In. and Larger

In 1891, having completed its plant for building finished guns, it secured an order from the United States army for 100 finished guns of 8-in. caliber and larger. This contract, the largest given by any nation for modern heavy guns, amounted to approximately $4,000,000, and I think it safe to say that, without such a contract at the beginning, the Bethlehem Company would never have been able to build up its present complete and modern ordnance manufacturing plant. This contract called for the furnishing of 25 8-in., 50 10-in. and 25 12-in. guns, to be delivered over a period of 12 years. The 100 guns were tested at the company's proving ground at Redington, Pa., located about six miles from its works. Each gun was fired 10 times at high velocity into the mouth of a tunnel which had previously been drifted to a depth of 10 ft. in solid limestone. It may be interesting to know that in the firing of the 1000 projectiles in the test of these guns the tunnel was extended an additional depth of 70 ft., and its original cross section of 50 sq. ft. was enlarged to 200 sq. ft.

An Order in 1899 for an 18-In. Gun

In 1899 the company received an order to design and make an 18-in. gun required for the test of the Gathmann torpedo projectiles. This gun, a success in every feature, weighed 60 tons, and its projectiles weighed 2000 lb. each. Although it was built 12 years ago the energy of its blow was practically the same as that of the great 14-in. guns with which our navy is now ahead of the rest of the world. This effort in 1899 marked the time when the company undertook the manufacture of ordnance work to its own designs as well as those of the Government, which field has been systematically extended until to-day the company's ordnance engineering department numbers over 100 trained men and its present successful ventures into competition with foreign manufacturers of ordnance have not only been due to its many years of experience in manufacturing but more to its technical preparedness and ability.

Ordnance, defined, means heavy artillery—guns of large caliber. The company manufactures besides heavy artillery the mounts and sights for such ordnance and guns and mounts of smaller sizes down to 1.43-in. caliber. It also furnishes ammunition of all kinds and sizes, shields for the various gun mounts, armor plate, and in fact is technically prepared to supply and is supplying the complete ordnance equipment for modern dreadnaughts, field artillery and all classes of fortifications. This material is made at the company's Lehigh plant, which is self-contained, and devoted almost exclusively to this and kindred products, the plant representing an investment of $25,000,000.

The Manufacture of a 12-In. Gun

Among the company's ordnance constructions I am going to invite your attention to the description of the manufacture of a 12-in. gun, armor piercing projectiles and hard-faced armor plate. [A colored drawing of a 12-in. Argentine gun was here exhibited by Mr. Grace.]

The drawing shows a built-up 12-in. gun of 50 calibers length, of Bethlehem design, which we are now building for the Argentine Government. This gun is composed of a comparatively thin liner, a tube surrounding the liner, and exterior hoops which surround the tube. The inside of the liner is the bore of the gun; the forward and middle portions of the bore are rifled, and the rear of the bore is enlarged to form the powder chamber. [After explaining how the strength of the gun is indicated in terms of the pressure of firing, Mr. Grace continued:]

When the projectile has been driven forward to a point in its travel in the gun where the propelling charge is exerting its maximum pressure in the bore, the gun has sufficient strength to resist practically twice the amount of the pressure without straining the metal in the gun to its elastic limit. Correspondingly, at the muzzle of the gun, where the pressure of firing has fallen to 15,000 lb. per sq. in., the gun has sufficient strength to resist a pressure in the bore of 25,000 lb. per sq. in.

Inspection of the Work at All Stages

The calculations of the strength of the gun are based upon the shrinkages to be applied to the layers of hoops entering into its make-up, which are in turn based upon specified physical qualities in the steel used in its construction, and departure during manufacture in either of these respects from what is required will have the gravest consequences. It is, therefore, to be expected that the most noticeable difference between the manufacture of guns and that of other high class finished material intended for industrial uses is in the character of its inspection. The inspection, whether by the different governments' forces or our own corps of inspectors, starts with the examination of the ingot before forging and continues in one form or another during all of the operations until the acceptance of the gun. It may be of interest to know that fully 17 per cent. of the nine months' actual time spent in the fabrication of a 12-in. gun is consumed in its inspection.

All of the steel to be used in the gun, whether containing alloys or not, is made by the acid open hearth process, using especially selected stock, and each ingot is fluid compressed to 89 per cent. of its original volume. The ingot, after the examination referred to above, is hollow forged under a 5000-ton hydraulic press, and is then rough machined preparatory to tempering. The hollow ingot for a 12-in. tube is 16 ft. long, 43¼ in. diameter, and weighs 67,700 lb. When it has been forged and rough machined preparatory to tempering, it weighs 28,000 lb. and

*A paper read at the Pittsburgh meeting of the American Iron and Steel Institute, October 25, 1912.

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in its finished state the tube weighs 18,950 lb. Correspondingly, the weight of the ingots for all of the forgings for one 12-in. gun is 458,000 lb., the rough machined weight of the forgings is 196,000 lb., while the finished gun weighs 148,500 lb. These figures will give you a fair idea of the large loss in weight the material of the gun undergoes during its fabrication, representing a yield from ingot to finished gun of a little over 32 per cent.

Processes Through Which the Forgings Pass

The specifications for gun forgings are especially drawn to insure in the forgings a close and uniform adherence to the physical qualities assumed in calculating the shrinkages and strength of the gun. The ability to meet these rigid requirements in the successful production of the gun forgings, without excessive and ruinous condemnations, has been acquired only after many years of experience in the gradual development of the various processes and products.

The forgings are tempered by being heated to varying temperatures, depending on their shape and composition, and then immersed in oil, or water, as the case demands. They are subsequently annealed, and finally submitted to the Government inspector, who selects official test bars and directs and witnesses the pulling of these bars to ascertain if the forgings meet the prescribed physical qualities, and tests are also taken for complete chemical analysis.

The forgings, having passed the test, are next finished bored in preparation for their assembling. This operation on the tube and liner forgings involves the use of boring mills with an overall length of 150 ft.

The assembling of the forgings by shrinkage is done under very narrow limits of tolerance, both as to the diameter of the parts and as to the amount of heat that is applied in expanding the exterior part. The first and most difficult is the shrinkage of the tube on the liner, because of the great length and consequent lack of rigidity of these two pieces. After the tube has been bored the liner is turned so that it is larger in diameter than the corresponding bore of the tube by the amount of shrinkage required. The determination of this difference in diameter is as precise as possible, and the character of the shrinkage surfaces must make them susceptible of reflecting the smallest errors in workmanship. The bore of the tube must be within two one-thousandths of an inch greater than the prescribed sizes, and dare not be less, and the outside diameter of the liner must be equally accurate. The necessity for this accuracy of work led to the abandonment of a 150-ton armor plate forging hammer, after being in operation less than two years, because the shock of its blows moved out of alignment the large gun boring and turning machines located some distance away.

The tube is uniformly heated until it has expanded so as to be slightly larger in diameter than the liner, and is then lowered over the liner until it is seated lengthways, when it is cooled in such a way as to draw its shoulders against those of the liner.

The Assembling of the Parts

After the assembled tube and liner have sufficiently cooled, they are carefully inspected and measured. By this time the next outer layer of hoops are bored, and after their bores have been measured, the outside surface of the tube is turned to its shrinkage size, and the operation of shrinkage is repeated. To complete the shrinkage of the gun its parts make six journeys to and from the assembling plant, and are set up in the gun lathes an equal number of times.

After the gun is completely assembled the bore is machined at the rear end to form the powder chamber, the gun is then finished turned on the outside, and finally the last operation, namely, the rifling, is performed. This operation takes 180 hours. The rifling consists of 72 grooves, requiring 900 passes of the rifling cutters through the bore of the gun. The rifling machine consists of a pair of bearings in which the gun is held, and a table 60 ft. long, on which a bar is supported. The bar carries the rifling cutters and has a slot running its entire length which has the same pitch as the rifling, and as the bar is moved along the bore of the gun it is slowly revolved, controlled by its slot, and its cutters produce in the gun the helical grooves, or rifling.

In the meantime the breech mechanism has been constructed and is now attached to the gun, which completes it, ready for proof. This consists of examination of the gun immediately before its firing, the firing of five rounds and a subsequent examination of the gun. If the firing has developed no defects, either in workmanship, material or performance, the gun is accepted.

The machine work alone in the manufacture of a 12-in. gun consumes 850 10-hour days, requiring the use of 195 different machines, and in all about 500 men performing some operation in its course of manufacture.

Making Armor-Piercing Projectiles

[A large drawing of an armor-piercing projectile was here shown.]

The manufacture of armor-piercing projectiles is essentially a metallurgical problem, combined with an elaborate system of heat treatments. The projectiles are made of alloy crucible steel, individually cast, forged, machined and heat treated, the treatment being especially prescribed for each projectile, depending on its known chemical composition.

The properties desired are those of extreme hardness on the point for penetration qualities, with a gradual decreasing in hardness in the main body and toward the base of the projectile to a very tough and fibrous condition, for the purpose of withstanding the shock of impact, and thus protecting and keeping intact the cavity provided in this portion of the projectile for carrying the high explosive charge.

The acceptance of projectiles is based entirely on the results of ballistic trials; consequently, the method and process of manufacture is left entirely optional with the manufacturer, so all the testing during the course of fabrication has but one object in view, namely, the placing of the material in a physical condition to meet the ballistic requirements.

For this ballistic test the projectiles are grouped in lots of 500 each, and when the full number comprising a lot have been satisfactorily treated to a desired physical condition the lot is then submitted to the Government inspector, who selects from it three projectiles for the ballistic trial. To successfully pass test and constitute acceptance, two of the three must pass through a Kruppized face-hardened armor plate of the same thickness as the diameter of the projectile, without breaking or having cracks extending into the cavity provided for the high explosive charge. The projectiles in this test are fired at a velocity approximately 300 ft. per second higher than in the corresponding armor plate test.

Having passed test, the projectiles are then ground smooth where they come in contact with the gun in firing, and finally receive the copper rifling bands and soft steel caps. The function of the band is to follow the rifling grooves in the bore of the gun, thus giving to the projectile its rotating motion, which increases not only the length of the flight but the accuracy as well. The soft steel cap serves to support the point of the projectile at the instant of impact on the hard face of the armor plate, thus preventing the hardened point of the projectile from being broken, and enabling it to penetrate the plate.

It might be of interest to note that a 12-in. projectile weighs 1000 lb., and a 14-in. projectile 1600 lb., with a cost for powder and projectile in the firing of one shot of $750 and $1,000 respectively.

The Manufacture of Armor Plate

The manufacture of armor plate, like projectiles, is essentially a metallurgical treatment process, but with problems as different as are the functions of the two products, they having in common but one feature, namely, that their acceptance depends on the results of ballistic trial.

Steel for armor plate is made by either the acid or basic open-hearth process, and cast in large rectangular sand-lined ingot molds, very heavily sinkheaded, the sinkhead serving as a tong-hold for carrying and manipulating the ingot during the forging operation, as well as insuring sound steel in the body of the ingot.

The subsequent heating and working of the large masses of alloy steel require the greatest care and skill. We have cast ingots for armor plate work weighing as much as 205,000 lb. Each ingot is forged to the approxi-

mate length and width of the finished plate, but to a slightly greater thickness, under a hydraulic press of 14,500 tons capacity. This press is the largest hydraulic machine in the world, and has a working pressure of 7000 lb. per sq. in., and is served by two traveling and turning cranes each of 150 tons capacity.

After forging, the plate is carbonized, this process consisting of covering the face of the plate with a carbonaceous material, and then continuously heating it for a number of weeks until the face of the plate has absorbed carbon to a depth of about 1¼ in., thus giving a plate of steel with one side much higher in carbon content than the other. The plate is then reforged to its finished thickness, this operation being done with such accuracy that, whether the plate be of even thickness or tapered, it is not necessary to machine its face, as is the practice in Europe, in order to obtain a clean and even surface.

The next step is to bend the plate to conform to the lines of the ship, or to form the turret and barbette structures, this operation being performed under a 6000-ton hydraulic press.

The plate is now ready for the various heat treatments and tempering operations, by immersing in both oil and water, through which it is taken until the proper physical condition is obtained, namely, an extremely hard face, undrillable with the best grade of self-hardening tool steels, to a depth of about a quarter of the thickness of the plate, with the remainder of the plate in a tough fibrous condition.

For ballistic testing the armor is divided into groups of about 500 tons each, and when all plates of a group have been finally hardened the Government inspector selects one plate to represent the group in ballistic trial. If the plate resists impact of three capped armor-piercing projectiles, of the same diameter as the thickness of the plate, without cracking or penetration, the group is accepted.

The plates are then finished, machined and erected as they will be placed on the ship, in order to detect and correct any deficiencies in their joints or alignment. The finished plates represent 45 per cent. of the weight of the original ingots.

It is obvious that the largest and heaviest kind of machine tools are required for the machining of armor plate.

The company has a capacity for finishing 1000 tons of armor plate per month.

It has been my desire to present to you, in as full detail as the opportunity would permit, a description of the manufacture at Bethlehem of some of the more interesting ordnance constructions. No description of our work would be complete, however, were I to neglect to make grateful acknowledgment of the influence and inspiration toward better work and greater endeavor received by the company from the army and navy ordnance departments of the United States.

Progress in the Preparation of Iron Ores*

Recent Developments in Concentration, Roasting, Agglomeration and Other Beneficiating Processes

BY J. W. H. HAMILTON.†

The rapid growth of the mining industry in the latter part of the nineteenth century caused a great development of metallurgical processes for the utilization of ores that, on account of their low grade or refractory nature, had been considered of little or no value. The development was particularly rapid in the treatment of copper and precious-metal ores, which because of their high values were more lucrative than the base ores. Although a great many students of ore conditions have long recognized the fact that the beneficiation of low grade iron ores was becoming one of our most important problems, the general opinion has been that iron ores of sufficiently high grade to use in their crude state in the blast furnace were so abundant that there would be no necessity of utilizing the lean ones.

Until recently the opinion has also been prevalent that with few exceptions the low grade ores could not be dressed and transformed into a product suitable for the blast furnace at a cost low enough to make it possible to sell this product at a fair profit in competition with natural ores. The work of geological institutions and the statistics on the consumption of iron ores have rapidly changed the general opinion and attracted attention to the low grade ores.

In 1870 the iron ore produced in the United States was 3,831,891 tons. Since that time the production has been doubled about every ten years, and in 1910 it reached the impressive figure of 56,889,784 tons. If the same rate of increase is kept up during the present decade, we shall be mining over 100,000,000 tons in 1920. In other words, we shall then be mining at the rate of over 1,000,000,000 tons in 10 years. In Europe the increase in production in the same period was not so rapid as in the United States, but iron mining has there also attained such proportions that a marked depletion has taken place in a great many of the iron mines. It was less than two decades ago that the old Bilbao mines in Spain, which for half a century have been among the chief shippers to English, French and German furnaces, were considered almost inexhaustible. To-day these mines show evidence of rapid decline. Other signs of similar nature are common.

It is, therefore, gratifying to note that a great interest is springing up in the conservation of natural resources. An expression of this interest was the request that was sent out to all civilized nations to take stock of their iron ore resources and submit their figures to the Eleventh International Geological Congress, held in Stockholm, in 1910. The records of this congress, published in "The Iron Ore Resources of the World," show that the known and recorded high grade iron ore deposits containing 60 per cent. or more metallic iron are very limited, the actual reserves being estimated at 1,300,000,000 tons and the potential at 687,000,000 tons. Out of these 1,095,000,000 tons actual and 123,000,000 tons potential ores are recorded for the Swedish mines. At that time the large ore deposits of Brazil were only superficially known and were not included. They have now been properly explored and it has been proved that they contain enormous quantities of high grade iron ores similar to the Swedish ores.

Very large ore reserves averaging from 50 to 60 per cent. metallic iron exist in various parts of the world; but the great mass of iron ores contains on an average much below 50 per cent. iron. In the records from the Lake Superior ore shipments one can observe a steady decline from year to year in the average iron content of the ores. It is therefore evident that we are rapidly approaching the era when the beneficiation of iron ores will be the rule and not the exception.

The Crushing of Hard Ores

Most mines are now equipped with crushers which break the ore to about 4 in. before it is shipped to the furnace. In Europe the buyers' specifications generally call for ore crushed to 6 or 8 in. Since the steam shovel was introduced for loading ore mined in open cuts, the crushers have been gradually increased in size until they now are built so large that they can break rock of any size that can be handled by the shovel. The types of crushers used in connection with iron ore mining, and particularly in connection with steam shovel mining, are

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the jaw crusher, usually of the Blake type, the gyratory crusher, and the Edison giant rolls.

The jaw crusher was for a while put in the background by the gyratory, but it is finding its place again. Each has a place. The jaw crusher can be built with a receiving opening that can take a larger rock than a gyratory of the same weight. A gyratory crusher can be built to give a larger output of a certain size than a jaw crusher of the same weight. In the case of the largest crushers the capacity does not make much difference, because it is generally so great that it is not practical to get the ore to the crusher fast enough to load it to its full capacity.

It is claimed that the gyratory consumes less power per ton of crushed ore than the jaw crusher. This may be true of slabby material, which is easily broken in the gyratory. A slab will rest both its ends on the concaves and the cone will hit it in the middle and break it with the exertion of very little power. A gyratory is therefore often termed a breaker instead of a crusher. There are few test records of any value for the comparison of the actual power consumption of the two types. The most noteworthy gyratory installation is at Nashwauk on the Mesaba Range, where a No. 24 crusher has been in operation for over a year. This machine is the largest of its type and has an opening of 48 in. between cone and concaves. The largest jaw crusher that ever has been built for iron ores was recently shipped from this country to the Kiruna mines in Sweden, where it will be employed for crushing ore for export, partly for the United States. The jaw opening of this crusher is 60 in. x 84 in. and the weight of the machine is about 400,000 lb.

The Edison giant rolls are used at the Benson Mines, N. Y., and similar rolls at the Cornwall Mines, Pa. At the latter place the ore is first crushed to about 14 in. size in a 42 x 60 in. jaw crusher, from which it goes to the rolls. These break the ore by impact and not by crushing, as do the ordinary crushing rolls. The surface of the rolls has a number of projections, "sluggers," which on account of the very high speed of the rolls and their great momentum give terrific blows to the ore pieces dumped on top of them and smash them to pieces. Such rolls are particularly effective on comparatively soft ore of the Cornwall type. This ore goes largely into fines during the mining and when these fines get wet they become sticky and are likely to choke ordinary crushers. On account of their high speed the Edison rolls throw off any ore that has a tendency to adhere to the roll shells.

The large ore crushers have been found to reduce the cost of mining considerably. Block-holding and sandblasting have been reduced to a minimum. It is much cheaper to break rock by mechanical power than by dynamite.

Fine crushing and grinding will be discussed in connection with concentration:

Concentration

Although the washing of soft hematites and brown ores is the ancient method of concentration, the greatest progress has been made in the treatment of magnetites, which on account of their magnetic properties are peculiarly well suited for concentration. The magnetites are concentrated either wet or dry. The advantage of one system over the other depends largely on the nature of the ore. As a general rule it can be said that the coarse crystalline ores can be treated to the best advantage by the dry method, whereas with the fine grained ores better results are obtained by the wet system.

Coarse Crystalline Magnetites

The coarse grained ores are generally easy to concentrate and the concentration can be done at a very low cost. The most expensive part of the operation is the crushing; and the coarser the grain, the less the cost. In many ores it is necessary only to eliminate pure rock which happens to get mixed with the ore in mining. In such cases, a cobbing of the ore after it has been crushed to about 2 in. is all that is necessary. Coarse grained magnetites are abundant in the Adirondacks in New York State, also in New Jersey and several other States. The large ore deposits of northern Sweden and those of the Grängesberg mines are principally of this type.

The most interesting separating plants working on coarse crystalline magnetites are those of Witherbee, Sherman & Co., at Mineville, N. Y. Experiments with magnetic separation were begun here as early as 1852, but it was not until the eighties that the magnetic separation began to take commercial dimensions. Since that time its development has been rapid. New mills have been built from time to time and to-day the company has the largest magnetic separating equipment in the world. The aggregate capacity of the four mills, when operating only one shift, exceeds 1,000,000 tons per year. As the milling system here represents the most up-to-date practice in dry magnetic concentration, we will discuss the various problems principally as they occur in connection with this plant.

COBBING

The cobbing of the coarse material was formerly done by hand, but mechanical cobbing is now becoming more common. At Witherbee, Sherman & Co.'s mines, magnetic cobbing has completely replaced hand cobbing, with the results that the cost of operation has been very much reduced, 4 men now doing the work that formerly took 14; that the cobbed product is absolutely uniform; and that there is no unnecessary loss of iron in the tailing. Within certain limits, the iron content in the cobbed ore can be varied simply by regulating the magnetic field. A rough cobbing is supposed to be done in the mine, but experience has shown that anything that is loose underground will some time or other come up the shaft, so it is best to depend entirely on the magnetic cobbing.

The ore is crushed to 4 in. as it comes out of the shaft and is then delivered by belt conveyor to a revolving screen with 2-in. perforations. The over-size is recrushed and returned to the screen; the through-size goes over the cobber. If it is desirable to take out low grade ore as well as high grade, the magnets are giving their maximum current and the tailing is immediately discarded. If only a high grade ore is desired, the cobber is given a weak field so that it picks out only the rich ore and the tailing is passed to another cobber with a strong field. The ore recovered on this machine is sent to the concentrator for crushing and separation and the tailing is discarded.

The cobbing machines are now often built to form the head pulley of a belt conveyor and they have revolving instead of stationary magnets. This arrangement has many advantages. Simplicity and head room are gained. No extra feeding arrangement is necessary. The ore enters a magnetic field that is moving with exactly the same velocity as the ore and it remains in this same uniform field until it has passed under the drum and is pulled off by the belt. On the drum type cobbers and all other machines with stationary alternating poles the ore pieces are forced to slip from one pole to another, during which operation they easily drop from the drum and go with the tailing.

DRY CRUSHING AND CONCENTRATION

After the ore has been crushed by jaw and gyratory crushers to about 1½ in. in size, the fine crushing is generally done by rolls. For sizes ranging from about 2 in. to ¼ in. the smooth rolls have been found to be the most efficient crushers. The size of the rolls should be made to suit the size of the material. For effective roll crushing, the material should therefore be carefully sized. Crushing rolls of as large size as 72 in. diameter and 30 in. face are used now on low grade copper ore. These rolls have a very large capacity and can crush ore from 4 in. down. The size mostly used for iron ores have 42 in. diameter and about 16 in. face.

Rigid rolls have been tried, but generally with disastrous results. It is, however, good practice to make the springs so stiff that they will give very little unless a piece of iron or steel happens to get in between the rolls. Corrugated rolls have a very good "nip" and can crush coarser ore than the smooth ones of the same diameter, but the corrugations wear off and then the nipping power diminishes so that the rolls can no longer do the same work. Also because corrugated rolls can not be trued up without removing the corrugations, they are not much in use.

The No. 4 mill in Mineville, which has only recently been put in operation, is the latest step in the evolution of dry magnetic separating plants. There is no guesswork about this mill. It embodies all the experience gained during several decades of operating magnetic separators. Its most noteworthy features are: the flexibility in the milling operation, gained by making the coarse crushing entirely independent of the separation and fine crushing; the close

sizing of the material before it is separated; the roll crushing of all fine sizes and the arrangement of the rolls so that any one of the eight sets of rolls can be cut out for repairs without interfering with the operation of the mill.

Only the fines are dried, as it has not been found necessary to dry the coarse ore. A vertical stack dryer of the Rowand type is used for the purpose. Between the crushing and the separating departments is a 1000 ton storage bin, which acts as a reserve bin, and is therefore by-passed in case the crushing and separating departments are in operation simultaneously. The coarse sizes are screened on revolving screens and the fine sizes on Newago vibrating screens. The coarse ore is cobbed on drum type and pulley type cobbers. Two machines are always used in series for a three-product separation. The concentrate from the first machine goes directly to the concentrate bins, the middling, which is the head product of the second machine, goes to the rolls for crushing and reseparation, and the tailing from the second machine goes to the dump. For the medium size ore the Ball and Norton drum type separator is used. The system of three-product separation with the rejection of tailing is the same. For the finest sizes the Ball and Norton belt type separator is used. As it is not always necessary to make a three-product separation of the finest sizes, these separators are arranged so that they can be operated either in series for a three-product separation, or in parallel for a two-product separation.

The capacity of the mill is 100 tons per hour or 1000 tons per day of 10 hours. As it requires only fourteen men to operate the whole plant the labor cost per ton of ore milled is very low. The iron content of the concentrate ranges from 64 to 65 per cent. and the phosphorus is about 0.03 per cent. The mill produces therefore an excellent Bessemer ore which, in common with other products of magnetic separation, has the advantage of great uniformity no matter how much the raw material varies.

Fine Grained Magnetites

When a fine grained, low grade ore is crushed to a powder a large portion of it goes into dust. It is difficult to make a clean concentrate from such material on dry magnetic separators; besides, the handling of the dust becomes a serious trouble in the mill. For this reason the wet crushing and separation has been found better adapted for ores of that nature. It has previously been mentioned that the fine crushing is the costliest part of the separating process and this is particularly true of the fine grained ores. The comminution should, therefore, not be carried any further than is necessary to liberate the ore crystals from the adhering gangue. While some fine grained ores can be separated satisfactorily after a crushing to 20 mesh, others must be crushed to 100 mesh or finer. Through a series of separation and screening tests the proper crushing size can be determined, but a more thorough knowledge is obtained by making a microscopic study of a thin section of the ore. The expert petrographer is able not only to measure the size of the ore crystals, but also to determine the various minerals that compose the gangue. Scientific methods are to-day being applied in engineering problems where a few years ago only rule-of-thumb methods were used.

The coarse crushing methods are the same as in the dry mills, but the fine crushing of iron ores to about 20 mesh is almost invariably done in the ball-mill. If the comminution must be carried further, the pebble-mill is used. The ball-mill is generally fed with ore crushed to 2 or 1½ in. It has been mentioned that the crushing rolls for crushing to ¼ in., or possibly to ⅛ in. is the most efficient crusher now used as to both power and wear and therefore the question arises whether or not it would be best to crush to ¼ in. by rolls and feed the ball-mill with that size instead of 2-in. ore. In a large mill it is possible that some saving in power and material could be effected.

However, the omission of the crushing rolls has advantages. The mill will be much simpler and there will be fewer stops in operation. The crushing rolls require a great deal more attention than the ball-mills. They have two belts, one of which is crossed, whereas the ball-mill has only one straight belt; the rolls run at a fairly high speed, causing a rapid wear of the bearings; the roll shells have to be kept true in order to crush effectively; and the rolls must be guarded against pieces of steel that happen to come with the ore from the mine. The ball-mill is a slow speed machine which, except oiling, requires very little attention. If pieces of steel should get into it no damage would be done. Most of the wear is on the balls, which are inexpensive and are replaced while the mill is running. The mill seldom requires a shut-down except for re-lining, which is done about once a year.

Taking also into consideration that even if the rolls are used the ball-mill cannot be left out unless it is replaced by some other machine, and that it is not the crushing from 2 in. to ¼ in., but the crushing from ¼ in. down that takes most of the power, the little saving in power and steel will hardly offset the disadvantages of complicating the equipment by introducing several more steps in the crushing operation. It is for this reason that, with few exceptions, in the wet mills all the crushing from 2 in. to 20 mesh is done in ball-mills.

The Hardinge conical mill which is now being used on iron ores has proved very effective as a ball-mill. To avoid too much sliming of the ore, it is of advantage to put a liberal stream of water through the mill so that the discharge flow is strong. A great deal of oversize is then likely to flow out, necessitating the screening of the discharge and the returning of the oversize to the charge end; but by this arrangement the capacity of the mill is increased and the wear of balls per ton of ore crushed is reduced.

Since 1910 another type of crusher, manufactured under various names, the Gardner crusher, the Pulverator and the Impact crusher has been tried for the same class of material as the ball-mill. The machine has certain merits. It is low in first cost and takes comparatively little power, but on hard and abrasive ores the wear of steel is high. When working on ores that break easily from impact, it will probably show good economy. This type of crusher has been installed at Moose Mountain, Canada, where it will be tried on a hard iron one on a large scale. In the dressing of fine grained iron ores many of the same machines are used as in the treatment of low grade precious metal ores. The pebble mill has found application on iron ores. Both the tube mill and the conical mill are used. Attempts have been made to replace the pebble mill with the Chilean mill, but the results have not been satisfactory on iron ores.

The largest and most interesting wet mill working on low-grade fine grained magnetite is the one at Sydvaranger, in Norway, about 220 miles north of the Arctic Circle. The ore is mined in open quarry and loaded by steam shovel. The crude ore averages about 36 per cent. iron and it takes about 2 tons of crude ore to make 1 ton of concentrate. In order to make a good separation it is necessary, on account of the fine grain of the ore to crush it to about 100 mesh. The first crushing is done in the two No. 18 gyratory crushers, which have a 36-in. opening between cone and concaves. These are followed by jaw crushers, reducing the ore to 2 in., which size is fed to the ball mills.

In the separating department there are 20 units, each containing one 7 ft. ball-mill, followed by one tandem set of Grondal No. 5 wide type magnetic separators, one 4½ x 22 ft. tube mill and one tandem set of Grondal No. 5 narrow type magnetic separators. The concentrate is dewatered in large concrete settling tanks and is taken from these tanks by overhead cranes and grab buckets to the briquetting presses. The yearly capacity of the plant is at present 500,000 tons of concentrate, one-half of which is briquetted. The rest is dried and shipped in the form of concentrate.

The power for the plant is generated in a steam-turbine power station, for which the coal has to be taken all the way from England and Germany. The plant has now been in operation nearly two years and it is gratifying to note that the results have been so satisfactory that a large extension has now been decided on. When this is ready the capacity will be raised to 750,000 tons per year.

At Moose Mountain, Ont., another concentration plant has been built for treating an ore similar to the one at Sydvaranger. The capacity of the first installation is to be about 350 tons of concentrate per day. Several new features have been introduced. The ore after having gone through the preliminary crushing to about 3 in. will be pulverized in impact crushers specially designed by the mining company. These reduce the ore to sufficient fine-

ness for separation on a tandem set of Grondal No. 5 separators. The concentrate from these machines is reground in Hardinge conical mills and is then retreated on the same kind of separators.

A new briquetting machine, which will eliminate the manual labor of transferring the briquettes from the press to the car, is also being developed by the company. The briquetting kilns are gas fired, and are of the Grondal type. The plant has the advantage over the Sydvaranger plant of cheap water-power. The briquettes will contain about 64 to 65 per cent iron, 0.02 per cent phosphorus and 0.014 per cent sulphur.

Titaniferous Ores

Although ferrotitanium and titanium steel are used in large quantities, the titaniferous iron ores, which are a mixture of ilmenite and magnetite, are not yet considered commercial ores. Most of the titanium is obtained from rutile and very little from ilmenite. Various attempts have been made to improve the titaniferous ores by magnetic separation, but it has been found impossible to make a high grade concentrate without losing too much iron in the tailing. The reason is that ilmenite is magnetic, although not so highly magnetic as magnetite.

If the titanic acid does not exceed 3 per cent., the ore can be smelted in the blast furnace without any trouble, but if the titanic acid is higher, the slag gets sticky and difficult to handle, unless special precaution is taken in preparing the burden. Experiments have been made by Rossi, who has demonstrated that under certain conditions ores of higher titanium content can be successfully smelted; but no such ores are at present worked on a large scale.

As there are large titaniferous ore deposits containing over 50 per cent. of metallic iron, there is no reason why these ores should not be utilized by mixing them with other ores and thereby bringing the titanic acid in the mixture within such limits as are not objectionable for the blast furnace. A great many of these ores can be mined cheaply and can be cobbed at a small cost by magnetic machines. The iron content in the cobbed product would be sufficiently high to make the ore desirable for mixing with other ores free from titanium. If a company operating on a large scale systematically mixed a certain portion of titaniferous ores with all ores shipped, it would, in many cases, be in a position to utilize without any detriment to the furnace operation as large a proportion as 25 per cent. of the titaniferous ores, now considered undesirable.

Hematites and Brown Ores

CONCENTRATION OF HARD ORES

Some hard hematites are mixed with magnetites. Such ores are generally crushed and sized and first treated on magnetic separators. The tailing from these machines is concentrated on jigs. If the ore contains only hematite it is hydraulically concentrated. The recovery on jigs is not so high as on the magnetic separators. In the former it is considered good work if the iron content in the tailing does not exceed 12 per cent.; in the latter it is often brought below 5 per cent. Jigging plants for hematite have recently been erected at Bathurst, New Brunswick, and Annapolis, Nova Scotia, and several plants are in operation at the Swedish mines.

THE WASHING OF SANDY AND CLAYEY ORES

The sandy and clayey ores are treated principally by washing or a combination of washing and jigging. Log washing is an ancient art, and there has been little development in the process, apart from the introduction of shaking tables for treating the fines. The improvements that have been made lately pertain principally to mechanical features in the construction of the machinery and the mills.

The washing plant of the Oliver Iron Mining Company at Coleraine on Western Mesaba is a notable example of modern mill construction. An interesting feature of this plant is that, although it has been built on level ground, the ore is never raised by either elevator or inclined belt conveyor. The ore trains are run over a high trestle into the top story of the plant and the ore is discharged from bottom-dump cars ino receiving bins that are sufficienly high to allow the material to drop by gravity from one machine to the other all through the plant, until it is finally discharged into the shipping bins.

The concentrate from the tables, which is delivered to the bins by means of Frenier spiral pumps, is the only ore that has to be raised to the bins by mechanical means. The plant is built in five units, and provision has been made for extension. Its capacity has never been definitely ascertained. Over 20,000 tons have been washed in a day without loading the machinery up to capacity. Besides the men employed at the picking belts, very little labor is required. As the ore is not crushed and therefore contains pieces too large for jigging, the oversize, after thorough washing in the revolving screens, is fed to wide slow-moving belts where the rock is picked out by hand. What goes through the screens is washed in log washers built entirely of iron and steel. The fines are treated on Overstrom tables.

The plant is well designed in every detail. Ample room is allowed for the machinery so that everything is accessible. For the protection of the men, railings and guards for belting and transmission are provided. There are galleries along the shafting to facilitate the oiling of bearings. Light and ventilation are also good. The machinery and transmission are heavy enough to meet all emergencies in case of temporary overloads, so that there is nothing to break unless it is worn out.

The washing plant of the International Harvester Company completed this year at Nashwauk, Mesaba Range, is built on lines similar to the Coleraine plant, but it has no tables for the recovery of the fines. Other plants on a similar scale are in construction in the Lake Superior district.

In connection with these mills it might be well to mention that in mill construction in general the improvements that have been made during the last few years are great. The crushing machinery has been much improved and the cost of crushing has been reduced by about one-half. Elevators, which used to give daily troubles to mill men, are built now so that they can run for years with little attention. Transmissions and milling machinery in general are built stronger and provision is made for heavy overloads. Weak and inadequate machinery is disastrous for a mill. The stops caused by little breaks here and there often cause losses that would pay a hundred times for a little extra weight in the equipment.

DRY CONCENTRATION OF CLAYEY ORES

Although wet processes have been almost universally employed for the concentration of hematites, dry methods have also been used. A treatment of that kind has been developed by E. F. Goltra, and a plant utilizing it has been built at Waucon, Wis. The principal features are the heating and tromling of the ore in a cylinder similar to a rotary dryer, and the removal of the gangue and clayey dust by means of a strong air blast created by a powerful suction fan connected to the charging end of the kiln. The air current and combustion gases and the material travel in opposite directions. It is too early to give any results from this process, but it has merits and will probably give satisfaction on certain kinds of ores.

Beneficiation of Phosphorus Iron Ores

Many magnetite ores carry apatite in the gangue. Such is the case with the Old Bed ores at Mineville, also with many of the Swedish ores. At Mineville most of the phosphorus is eliminated by magnetic separation, and the tailing, which contains, besides the apatite, several more or less weakly magnetic minerals, such as garnet and hornblend, is cleaned on strongly magnetic Wetherill separators. Part of the apatite concentrate, containing over 40 per cent. bone phosphate, is sold to fertilizer works, but as only the high grade apatites are suitable for treatment by the acid method, the market for the low grade product is limited.

In order to be able to utilize also the low grade material, Dr. W. Palmaer has developed an electrolytic process by which it can be converted into a high grade fertilizer. A plant on a commercial scale is now in operation at Trollhättan, Sweden, and in this plant some of the phosphorus magnetites from the mines in Lapland have been successfully treated. It is possible to treat either the tailings from separating plants or the crude ore. At the Kiruna mines in northern Sweden there are enormous deposits of magnetites containing about 56 per cent. iron with a gangue composed almost exclusively of apatite. When this ore is treated by the Palmaer process, the iron content is raised to 71 per cent. and the phosphorus is lowered to 0.03. The apatite is converted into bicalcic

phosphate. The product is citrate soluble and has about the same value as double superphosphate.

For several years culture trials have been carried on with the Palmaer product, which is known in the trade as diphosphate, and it has been proved that it has the same fertilizing properties as the water soluble phosphate. The chief requirement for this process is cheap power, which is abundant in the neighborhod of the Swedish mines. The recovery by it is complete, as there is no loss of iron in any tailing, and practically all the apatite is transformed into bicalcic phosphate. The Palmaer process is the first commercial electrolytic process that has been used for the beneficiation of iron ores.

Roasting and Agglomeration

Hard Ores

While in the United States hard ores are roasted only when they are high in sulphur, the practice in Sweden is to roast nearly all lump ores. As charcoal is used there almost exclusively for making pig iron, it is necessary to economize this expensive fuel, and for that reason the ores are roasted not only to eliminate sulphur, but also to oxidize them and make them more porous. When some of the hard ores are crushed they produce so much fines that the roasting becomes difficult in ordinary furnaces. At the Oxford furnaces in New Jersey, to avoid this trouble, the ores used are screened and the fines are roasted separately in Wedge rabble furnaces.

Soft Ores and Concentrate

Few of the fine grained soft ores are suitable for smelting in their crude form. Still, they are used in large quantities, and a comparatively small proportion is transformed into a suitable lump form. Increasing interest has recently been shown in the processes for treating these ores preliminary to smelting. The good results obtained at the furnaces that now are operating with the improved ore are so obvious that it will be an inducement for those who are troubled with fines to transform at least part of them into suitable lump form. The most common methods of treating the fines are nodulizing, briquetting and sintering.

NODULIZING

The nodulizing process was first used on a large scale for desulphurizing and agglomerating pyrites residues at the plant of the Eastern Nodulizing Company, at Hackensack Meadows, N. J. It is now used on nearly every kind of ore. The product of nodulizing kilns is a good blast furnace material, but the nodules are more glazed and not so porous as the products from some of the other processes. The Pennsylvania Steel Company, at its Lebanon plant, is nodulizing magnetic concentrate from the Cornwall ore.

Several plants have been built for the nodulizing of flue dust, for instance that at Hubbard, Ohio, and the plant at the Iillinois Steel Company, South Chicago. A plant for treating siderites high in sulphur has been built at the Magpie Mine, Michipicoten, Ont. Here the carbon dioxide as well as the sulphur is driven off. The largest nodulizing plants are those treating Cuban brown ores in the province of Oriente, Cuba. The Mayari and Moa ores contain as much as 14 per cent. chemically combined and 25 per cent. hygroscopic water. By the nodulizing of the ores they are therefore reduced nearly 40 per cent. in weight. Some of these ores are now being treated in Greenawalt sintering plants, built by the Pennsylvania Steel Company at Sparrows Point, Md., and Steelton, Pa.

To reduce freight charges some ores are simply dried in rotary kilns. Plants for this purpose have been built at the Hollister mine, Crystal Falls, Mich., and at the Brunt mine and Mountain Iron on the Mesaba Range. The moisture content of the hard ores is negligible, but, as previously stated, the soft ores can absorb as much as 25 per cent. of water. After the ore has been dried some moisture may be reabsorbed during transportation, but the amount is small, considering that from the time the ore is shipped until it reaches its destination the rainfall seldom exceeds a fraction of an inch.

BRIQUETTING

The first successful briquetting system for iron ores was developed by Dr. Grondal, who worked principally with fine grained magnetic concentrate. This material is particularly well adapted for briquetting. The principal features of properly made Grondal briquettes are: They have no artificial binder and can therefore stand heat without disintegration; they are not vitrified but are very porous and easily penetrable by the reducing gases; they are strong and can be handled without going into fines; they are nearly free from sulphur even if the sulphur content in the crude ore is as high as 2 to 3 per cent.; they are highly oxidized and the magnetite is transformed into hematite; they are easily reducible in the furnace.

Fine ores of nearly all kinds are now briquetted. Over 500,000 tons of briquettes are yearly produced from magnetic concentrate in Sweden and Norway. Large quantities of limonites are briquetted at Spain, and pyrites residues in England and the United States. During the past year a four-kiln plant has been in operation in Mayville, Wis., briquetting the Mayville ore, an oolitic hematite of the Clinton formation. The briquettes are used at the furnaces of the Northwestern Iron Company, where the advantages gained by briquetting fine ores have been well demonstrated. Only part of the ore is briquetted and about 30 per cent. of the burden is made up of briquettes.

The advantages gained are many. The amount of flue dust has been greatly reduced, resulting in a higher efficiency and a longer life of the stoves; the "hanging" and "slipping" has been eliminated, whereby good control of the furnace has been obtained, and a uniform product is produced; the life of the lining is much prolonged; the output of the furnaces has been increased without corresponding increase in labor; and the grade of pig iron has been improved.

Other briquetting processes have been developed in Europe, but have not found application here, with the exception of the Schumacher process, which is used only on flue dust. It utilizes the hydraulic qualities of the flue-dust to bind the ore.

SINTERING

The application of blast roasting to the sintering of fines and flue-dust is the latest development in the preparation of iron ores. The Huntington-Heberlein process, which is successfully used for roasting sulphides, has not been found so effective for sintering fines as the two down-draft processes, both of which are now employed on iron ores. The continuous system developed by Dwight-Lloyd for the treatment of copper sulphides and flue-dust is now successfully working on iron ore flue-dust.

At the plant owned by the American Ore-Reclamation Company at Birdsboro, Pa., experiments have been made with various kinds of ores; Cuban brown ores, magnetic concentrate, etc., all of which have been sintered successfully. In the flue-dust there is often enough coke to sinter it without the addition of any other fuel, except that required for ignition. If there is an excess of coke it is best, in order to get the full benefit of it, to mix in some fine ore free from fuel. The sinter produced makes a good blast furnace material. It is porous and offers a large surface to the reducing gases.

The Greenawalt sintering process has been referred to in connection with the Cuban ores that are sintered by the Pennsylvania Steel Company at the Steelton and Sparrows Point plants. As the process has been very little described in the technical press, a few details may be of interest.

The Greenawalt system is intermittent. The ore is mixed with fuel, generally in the form of crushed coal or coal screenings and charged in large shallow pans in which the grate bars are placed from 10 to 12 in. from the top. The charge is made level with the top of the pan and an igniter carried on a track is placed over it. The pan is suspended on hollow trunnions connected to an exhaust fan which is started as soon as the oil burner in the igniter is turned on. In less than a minute, the reaction has spread all over the surface. The igniter can then be removed. It takes from 15 min. to 1 hr., depending on the nature of the material, to complete the sintering of a batch. When the reaction has reached the porous bed, which is a layer of inert sintered material spread on top of the grate bars for their protection, the suction fan is shut down and the pan is tilted to allow the sintered material to drop out on a grizzly or directly into the railway cars. The pan is then returned to a horizontal position and is ready for the next batch. The capacity of the pan depends much on the

nature of the material. From some ores as much as 100 tons can be produced in 24 hr. in a 7 x 12 ft. pan. From other ores only 50 to 60 tons can be produced.

Some interesting features have been noted during experiments with this process. It has been found to be of importance to have the moisture content in the ore within certain limits in order to obtain good results. Some ores, for instance magnetic concentrate, require about 7 per cent. of moisture, whereas others, as for instance pyrites cinder, sometimes require over 20 per cent. Some ores can be sintered in about 15 min. and others require as much as an hour.

The desulphurization by this process is very good, provided that the fuel is not used in excess. If an ore is high in sulphur, little or no coal should be added, and the less coal is added the more complete is the desulphurization, provided that the ore contains enough fuel for the necessary combustion. Experiments have been made with a magnetite ore containing 1½ per cent. of sulphur in the form of pyrrhotite. With the addition of only 2 per cent. of coal, a good sinter containing 0.05 per cent. sulphur was produced.

Other ores in which the sulphur has been combined with calcium and barium forming gypsum and barium sulphate, combinations which in ordinary roasting furnaces are very difficult to break up, were successfully desulphurized. To obtain good results it was found necessary to use barely enough fuel to agglomerate the charge without fusing it into vitrified masses that would be impenetrable to the gases. If an insufficient amount of fuel is used, the sinter becomes soft and, to a large extent, goes into fines. If an excess of fuel is used, the sinter becomes glazed and, in spite of its honey-combed nature, loses in porosity. It is not possible to avoid all vitrifying and still make the sinter strong enough for transportation and handling, but it can be reduced to a minimum if the fuel is correctly proportioned. A noteworthy feature found during these experiments is the remarkably low fuel consumption.

That all these developments in the preparation of iron ores, which have here been presented, have been made while we still have a large supply of high grade ores that can be utilized without any preliminary treatment, gives evidence that a great deal more must be done in the near future, as we are rapidly entering into the era of low grade ores.

The Use of Electric Power in Steel Mills*

A Comparison of Methods of Production and Distribution—The Question of Alternating or Direct Current Motors

BY STEWART C. COEY†

The increase in the use of electric power in steel mills has more than held its own with the rapid advance of the application of electric power in other lines of industrial work. Electricity was first used in steel mill work for lighting purposes in 1881, in which year the first Brush series arc light dynamo was installed at the Brown, Bonnell & Co.'s plant in Youngstown, Ohio. About 10 years later the Edgar-Thomson Company, in Bessemer, Pa., installed a 50-h.p., 250-volt direct-current generator, and this machine, which was a large one for its time, was used to furnish power to an experimental crane over the soaking pits in the blooming mill.

From 1892 to 1902 the development of the electric motor drive was carried on by the use of the 220-volt direct-current system. It was quite generally recognized that, due to the fact that steel mills are of necessity spread out over large areas of ground, a great saving could be accomplished by the distribution of power by means of electricity for driving all auxiliary apparatus. However, during this period there was a constant check on electrical development as there were neither motors nor control apparatus constructed to meet steel mill conditions. At the end of the period a power plant of 500 kw. capacity was considered large for a steel mill.

Impetus Given by Alternating-Current Machinery

Within the last 10 years a number of the points that retarded the development of the use of electricity in steel mills have been removed by the general advance of the art and by the development of special apparatus to meet steel mill conditions. The development of the alternating-current system of generating and distributing electricity, the mill type motor, the steam turbine and the gas engine have all been big factors in the rapid advance of the use of electricity in steel mills in this period.

The use of 220 volts, direct current, necessitated the use of generating units that were large in size and high in cost per unit of power capacity. These generators were driven by reciprocating engines which gave economical conditions of operation over only a small range of load. The economy of reciprocating engines also has to be watched closely to keep it up to its maximum efficiency of operation. In distributing the electric power at 220 volts it was found that about 1500 ft. was as far as power could be economically distributed at this voltage.

The development of the alternating-current system of power generation and distribution made it possible to centralize the generation of power and not only give the added advantage of centralization, but also to make use of the blast furnace gases for generating power for use in all parts of a group of steel making and finishing mills.

Present Standard Voltage for Steel Mill Work

When alternating current was first used in steel mills, a voltage of 2200 was adopted in a number of the plants. Later developments resulted in the adoption of 6600 volts, three phase and 25 cycles as the standard voltage for steel mill work. This is a voltage at which power can be economically transmitted at distances up to about 6 miles and it is also a good generator voltage. While it is possible to generate electricity at higher voltage than this, it is not practical to consider higher voltages in steel mill work as the large amount of dirt and gas in the air makes conditions harder than for ordinary operation. The three-phase system has become standard on account of its good electrical properties in motor operation and a frequency of 25 cycles has been almost universally adopted in steel mills as comparatively low speeds are desirable in a large percentage of the motor applications.

The type of prime mover for electric power generation that is best suited for use in steel mills is a very broad subject and in the majority of cases it is a problem that has to be gone over very carefully for each individual plant. Wherever possible the sources of energy which have in times past been allowed to go to waste are now utilized and turned into electrical energy. The blast-furnace gases, which are not used in the stoves, are now either used under boilers to generate steam, which is in turn used to operate blowing engines and steam turbines, or else the gas is used directly in gas engines as a means of generating power. The problem as to which of the two methods of using the blast-furnace gas should be adopted is very complicated, and one that takes in a number of different factors.

Blast-Furnace Gas Engines Versus Steam Turbines

On a theoretical basis the amount of gas necessary to generate electricity with a turbine plant, the gas being burned under boilers is nearly twice as much per kilowatt-hour as in the case of a gas-engine installation. Commercial tests indicate that this figure averages on existing installations about 20,000 B.t.u. per kw.-hr. for the gas engines and about 30,000 B.t.u. per kw.-hr. for the turbine in-

*A paper read at the Pittsburgh meeting of the American Iron and Steel Institute, October 25, 1912.

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stallation with gas burned under the boilers. This is a very important item effecting, as it does, a conservation of energy. However, there are other items to be taken into consideration that are very greatly in favor of the use of turbine plants.

In considering the final cost of power the saving in one item may very easily be offset by the increase in another item. It is the item of fixed charges that runs the cost of power up in gas-engine plants. The initial cost of a gas-engine installation per kilowatt of generating capacity installed will vary with the conditions, but a value of $125 per kilowatt is very close to the average condition. In the case of a turbine installation with gas-fed boilers this figure will average about $75 per kilowatt.

The depreciation of gas engines is very much higher than in the case of turbine units, due in a large degree to the fact that in the gas engine there is a rapid variation in the stresses on the engine during each cycle of operation, while in the steam turbine there is a constant torque applied. A value of 8 per cent. for the gas-engine plant, which corresponds to a life of approximately 10 years, and 5 per cent. for the turbine plant, which corresponds to a life of approximately 14 years, is if anything in favor of the gas-engine plant.

The interest on the initial investment can be taken at 6 per cent. in each case. If, as is often the case, the company considering the installation has only a limited capital or borrowing capacity and could use the money represented in extending portions of its producing plant which would net larger returns on the money than 6 per cent., the percentage returns which this extension would bring should be used in place of the actual interest in this special case.

Experience has shown that the maintenance and repair charge is more than double in gas-engine plants for the same reasons that the depreciation charges are higher. The operating labor is also higher in gas-engine plants than in turbine plants.

If we neglect these two items and use simply the interest and depreciation figures with 1 per cent. for taxes and insurance in each case, we have a total fixed charge of 12 per cent. on the turbine plant and 15 per cent on the gas-engine plant.

Figures Based on Youngstown Sheet & Tube Plant

The effect that this fixed charge has upon the cost of power depends entirely upon the load factor. If the load factor of the Youngstown Sheet & Tube Company is taken as in a measure indicative of the average in steel mills, we get a figure considerably lower than most comparisons are made on. The total present capacity in this plant is 9000 kw., and during the last year there has been generated 36,000,000 kw-hr., or an average of 4110 kw. for each hour in the year. This is a load factor of 46 per cent. and incidentally it is well to note that this plant is operating with as small an equipment of spare apparatus as it is policy to operate with in a steel mill. This load factor would mean that the fixed charges would be as given in the table.

Comparing Fixed Charges of Gas Engine and Turbine Installations for the Same Output

		Per kilowatt of capacity			
	Fixed charges per cent.	Plant cost.	Fixed charges.	Power generated per year kw.	Fixed charges per kw.hr.
Gas engine installation....	15	$125	$18.75	4030	0.46c
Turbine installation.....	12	75	9.00	4030	0.22c

In other words, the fixed charges under these conditions are 0.24 cent more for the gas-engine installation than for the turbine installation.

Favorable Position of the Steam Turbine

Commercial tests on turbines show actual operating efficiencies of less than 20 lb. of steam per kilowatt-hour. Power for operating condenser auxiliaries adds about 10 per cent. to this, making the operating efficiency 22 lb. per kilowatt-hour of power delivered. The cost of steam generated from coal determined from the average at the Youngstown Sheet & Tube Company is 10 cents per 1000 lb., including boiler house auxiliaries and labor. This would give a value of 0.22 cents per kilowatt-hour as the value of the steam generated from coal for a turbine installation.

From the foregoing it can readily be seen why in this special case it is impractical to consider the use of gas engines. If the value of the gas is neglected a turbine installation using coal as a fuel at the prices prevailing in this district would generate power under these conditions at a cost per kilowatt-hour less than could be obtained by the use of gas engines. Where the price of coal is high the cost per kilowatt-hour changes and this cost comparison changes in a corresponding degree.

Leaving aside all cost considerations the main arguments in favor of the steam turbine are the reliability of its operation and its good operating efficiencies over wide ranges in load. Reliability of operation is a factor that means more in steel mill operation than in any other line of industrial work, as a shut down in the power plant of a few minutes is liable to mean a big tonnage loss in one or more of the various departments.

Utilizing Engine Exhaust in Low Pressure Turbines

A source of power which has been developed in late years is found in the use of exhaust steam from large non-condensing reversing engines which are quite common in a number of steel mills throughout the country. This steam is collected in regenerating tanks and used to produce power by means of low-pressure turbines.

At the Youngstown Sheet & Tube Company there is a 1500-kw. mixed-pressure turbine operating on the exhaust from the blooming mill reversing engine. This installation furnished during the last year 5,000,000 kw-hr. of energy to the switchboard from what was before waste energy. After deducting the amount of power represented by the extra amount of steam used by this turbine in generating the 2,000,000 kw-hr. which it generated in this time on high-pressure steam over what would have been used by a turbine designed especially for high-pressure steam and the energy equivalent of the added back pressure on the reversing engine, there is left approximately 2,500,000 kw-hr., which represents the actual amount saved by the installation. One point in favor of this type of an installation is that it requires no extra boiler capacity and tends to keep the load on the boiler house more uniform as the machine is only taking high-pressure steam when the mill engine is down. The ease with which alternating current stations can be run in parallel makes it possible to utilize these so-called waste energy sources and still operate the various sources of power in electrical connection.

Motors and Voltages in the Mills

In considering the problem of electric power generation and distribution, the connecting link or switchboard is likely to be neglected. The proper design of the switchboard very often determines the success or failure of a power installation. It is only due to the development of the oil switch that it is possible to handle large alternating currents at high voltages with safety.

As has been said before the standard generator voltage of 6600 volts is economical for transmission purposes up to about 6 miles. Where it is desired to transmit to greater distances than this it is the practice to use step-up transformers to give a line voltage of 22,000 volts for transmission purposes with step-down transformers at the other end of the line to give 6600 volts or whatever voltage is desired for distribution.

After getting the electricity to the point at which it is desired to use it, the problem of the proper method of distribution in the mills presents itself. On account of the insulation problems in the mills proper it has become customary to use 220 volts, either A.C. or D.C., for all mill motors except the very largest ones. Large roll motors and pump motors are built for 6600 volts but it is not generally considered good practice to use 6600 volts direct on motors of less than 500 hp. For use on all constant-speed work, the alternating-current motor is desirable, and for this type of work it is customary to use induction or synchronous motors depending on the special conditions of service.

Whether alternating or direct current should be used on the roll tables, cranes and other steel mill auxiliaries is a problem that has been discussed very seriously among steel mill electrical engineers and opinions are greatly divided as to which type of motors it is advisable to use. If 220-volt alternating motors are used it is necessary only to use A.C. transformers to step down the voltage from 6600 to 240 volts, but these transformers have to be large in kilovolt-ampere capacity, as these auxiliary motors run for a great portion of the time underloaded, giving a

poor power factor for the combined load. If 220-volt D.C. motors are used, it is necessary to use motor generator sets to transform the alternating current into direct current, with a loss of power at this point of about 12 per cent. more than in the A.C. transformers, which have an efficiency of about 98 per cent.

The initial cost of the two systems is about the same, being if anything slightly in favor of the D.C. system. For instance, on a certain contemplated system, the average cost of A.C. motors and control equipment was found to be $25 per hp., while the D.C. motors and control equipment averaged $21 per hp., showing a difference of $4 per hp. in favor of the D.C. equipment. On this auxiliary apparatus there is always a portion of it that is working under light load or not operating at all. As an example, in a blooming mill, certain tables will operate at various points throughout the mill as the steel goes through but never all at one time.

Motors for Electric Cranes

On cranes it seldom happens that all the various motions are called into action at one time. As a matter of fact it is found that this auxiliary apparatus gives a load in kilowatts that is approximately one-quarter of the total rated horsepower of the motors. Motor generator sets cost about $14 per kw. of capacity more than transformers, which figure would be offset by $16 additional cost of the A.C. motors and control over the cost of the D.C. motors and control, as it is only necessary to have 1 kw. of motor generator set capacity for each 4 hp. of auxiliary motors installed. The main point where the A.C. motor saves is in the elimination of the commutator, but this is offset to a certain extent by the fact that the air gaps in A.C. motors must of necessity be less than in D.C. motors. An actual comparison of the air gaps in a comparative line of A.C. and D.C. mill motors shows that the D.C. motor has twice the air gap that the A.C. motor has on an average.

This results in a big increase in bearing trouble which offsets to a large extent the saving obtained by the elimination of the commutator. However, the point on which the whole question hinges is, in the writer's opinion, the fact that the control of the D.C. motors has been developed better and is simpler than for the A.C. motors. By the developments of the last year it is possible to use automatic control on all the D.C. auxiliary motors at about the same cost as manual controllers and get a control that is both simple and effective. The saving gained by the use of automatic control, by reducing the number of breakdowns both electrical and mechanical, was the determining fact in causing the Youngstown Sheet & Tube Company to continue the use of 220-volt D.C. motors for auxiliary motors in the new developments. These same reasons apply on crane motors with the additional fact that the use of dynamic braking cannot be obtained in a satisfactory manner if A.C. motors are used on crane hoists. By the use of dynamic braking hoist controllers and the elimination of the mechanical brake at least one-half of the troubles with cranes are at once done away with.

The use of D.C. auxiliary motors also allow for the correction of the total power factor of the plant. This is accomplished by designing the motor generator sets to operate with a leading current in the synchronous motors. This reduces the losses in the transmission line and turbo generators and compensates to a large extent for the increased losses in the motor generator sets as compared to the losses in A.C. transformers.

It is quite possible that a simplified system of control may be developed in the near future for A.C. motors that will offset this advantage in favor of the use of D.C. motors for reversing and crane service. The rapid developments of the last ten years indicates that this is only one of the minor possibilities of the developments that undoubtedly will come in the use of electricity in steel mills.

Discussion

By B. R. Shover, Chief Engineer Brier Hill Steel Company

Mr. Coey has been obliged to treat his subject in a broad and general manner. Because of the many various conditions met with, particularly in existing plants, it is manifestly impossible to formulate exact rules governing the best methods for the generation, distribution or use of electric power. Consequently, the only way to obtain the best results is to study each situation carefully, taking into account all the factors bearing on the case in the particular plant in question.

New Designs Sometimes Grow Out of Repairs

The subject of gas engines versus steam turbines has been under discussion for a long time, and will require a still longer time for settlement. Although the results obtained in some plants do not verify it in most cases, Mr. Coey's contention that the depreciation, maintenance and repairs of gas engines are in excess of these items in the case of steam turbines is probably true at the present time, but a very large percentage of these items is still due to imperfect design resulting from lack of knowledge and experience on the part of the manufacturer. Many expensive so-called repairs are really changes in the apparatus, which changes will later result in materially reducing this part of the cost of operation.

The turbine advocates have probably forgotten that when the turbine was as new as the gas engine is at present the advocates of the reciprocating steam engine could justly claim a distinct advantage in the question of repairs, maintenance and depreciation, which advantages, due to improvements in the turbine, have since been reversed. Likewise, it may be expected that further perfection of gas engine details will tend greatly toward lessening this disadvantage and might perhaps eliminate it entirely. One item usually forgotten, and which should be included, is the difference in cost of repairs, etc., on gas-cleaning plants and on steam boilers, which comparison is decidedly in favor of the gas engine.

Operating Large Mill Plants in Parallel

It is true that both the lack of overload capacity and a low load factor are against the gas engine. Experience has proved that the larger the electrical installation the lower is the percentage of load fluctuation, indicating less need for overload capacity and a higher load factor, consequently in large stations these quantities are of less importance than in stations of the size given in Mr. Coey's paper. The results obtained by paralleling the power stations at the South Works of the Illinois Steel Company and at Gary, although separated by 18 miles, proves the advantage of large stations, particularly where gas engines comprise the greater percentage of prime movers, and steps are now being taken in at least one other location to tie stations together in order to accomplish the same results.

Mr. Coey's figure of 30,000 B.t.u. per kw.-hr. is perhaps correct for high-pressure turbines under operating conditions. Probably the best efficiency obtained at present from steam-driven generators is at the Fifty-ninth street station of the New York Interborough Rapid Transit Company, where a combination of a compound reciprocating engine and a low-pressure turbine, having a combined capacity of 15,000 kw., gives a result of 21,800 B.t.u. per kw.-hr. The figure 20,000 B.t.u for gas engines is, however, high for good practice, since the average performance on four 2000-kw. gas engines at the South Works of the Illinois Steel Company for a period of six months under actual service, not test, conditions, was approximately 15,000 B.t.u. per kw.-hr.

Maintenance Costs of Gas Engine Plants

As evidence that maintenance and repairs are not a serious item in the case of all gas-engine-driven plants, one moderately sized plant in the Pittsburgh district has an average cost for the first six months of this year of 0.21 cent per kw.-hr., and the best average yearly cost of three plants having an aggregate generating capacity of 20,000 kw. is 0.25 cent. There are also quite a number of gas-engine-driven generating stations in steel works service the cost of which on the same basis is 0.3 cent or less. These costs are authentic and include all operating expenses except interest, depreciation, taxes and insurance, which items amount to about 0.14 cent, making a grand total cost of but 0.39 cent per kw.-hr.

It is therefore quite reasonable to suppose that the increased load factor due to larger stations and the decreased depreciation, maintenance and repairs due to improved details will place the gas engine on nearer an equal footing with the steam turbine as regards these items, leaving the higher efficiency of the former to show an interest on the increased first cost, which will be practically proportional to the cost of coal.

Inherent Advantages of the Steam Turbine

There are, however, two points in which the turbine will always maintain the advantage, namely in easier operation due to simplicity of the prime mover, wiring and switchboard and in reliability of service. None of these can be either capitalized or neglected, consequently judgment, or perhaps a willingness to take chances, will have to determine whether or not one should take advantage of the possible savings due to the installation of gas engine driven generators.

Relative to the use of low or mixed-pressure turbines in connection with regenerators and steam engines having an intermittent load, some engineers are now claiming that when interest, depreciation and taxes are considered, straight high-pressure turbines will deliver power at as low a cost as the above combination and give a simpler and more reliable outfit.

Too much stress cannot be laid on the point brought out by Mr. Coey relative to the importance of a good switchboard equipment, as some operating men have discovered to their sorrow.

Safety and Overhead Wires

Mr. Coey has touched lightly upon the subject of power distribution. In the former days when 250 volts direct current only was used in mills, the cost of lines and supports was comparatively low and the danger negligible, so that practically all distribution was made by overhead lines. Unfortunately this precedent has been largely followed in the case of high-tension transmission, so that now the majority of plants have a network of 2200, 6600 and even 22,000-volt lines mixed up indiscriminately with low-tension wires and extending over the entire plant.

There is at present a great safety movement throughout the steel industry; gears are being guarded, railing, walks and stairways are being installed, and all manner of danger signs posted, the large majority of such things being to protect or warn the workmen against dangers plainly evident to an ordinary observer. Meanwhile the apparently harmless overhead wire is allowed to remain the hidden danger it always has been even though there is probably not a single plant so equipped that has not had one or more fatal accidents resulting from high-tension overhead lines. It is safe to claim that in a plant with a generating capacity of 10,000 kw. and where the points of delivery are not too widely scattered, a good underground distribution can be installed as cheaply as a good overhead system, while in larger plants the underground system will cost less. Consequently, plants starting the use of high-tension even in a small way, since their installation is sure to increase, should, both as a question of present safety and future economy, give careful study to the distribution question before deciding in favor of overhead transmission just because at the time it is cheaper.

Alternating Versus Direct Current for Small Motors

The subject of Mr. Coey's paper is "Generation and Distribution," but since the text includes some applications or use of power, it will not be amiss to add something in this line, although of course the subject of application is large enough for a multidude of papers on different phases of the situation.

In discussing the question of A. C. versus D. C. for driving auxiliary apparatus, Mr. Coey has shown a tendency toward favoring the D. C. motor. This question has been debated pro and con for some time, and a joint paper on this subject entitled "The Cost and Efficiency of Alternating Versus Direct Current Motors for Steel Mill Auxiliaries" was presented by the writer and E. J. Cheney at the 1911 convention of the Association of Iron and Steel Electrical Engineers, the conclusions of which were as follows:

1. The all A. C. system costs slightly more than the mixed system.

(a) Excess first cost higher for 22,000 volts transmission than for 6600.

(b) Excess first cost higher for gas engines than for turbines. From which it appears that the higher the first cost of power supply the less favorable is the use of all A. C. system.

2. The lower the power factor, the greater is the excess cost of the all A. C. system for both percentages of auxiliary load.

3. The less the percentage of auxiliary load, the less the excess cost of the all A. C. system for both power factors.

4. The annual costs of the all A. C. system are lower than those of the mixed system.

5. The actual operating costs, that is excluding interest, depreciation, taxes and insurance, of the all A. C. system are considerably less than those of the mixed system.

6. The excess cost of maintenance of the mixed system is based on an estimate and not on actual records. Should this item be entirely neglected, the results in nine out of sixteen cases would show an excess of annual costs for the all A. C. system, but the amount is so small that accurate calculation for any individual case would be necessary to determine the relative advantages.

7. When the saving in output due to the less delays in the all A. C. system is taken into consideration the saving in annual costs, as tabulated, will be largely increased, and even should the difference in motor maintenance be neglected there would still be a considerable saving in annual costs for the all A. C. system.

In conclusion, then, for a rolling mill properly motored, where there are no problems of electric drive which have not been successfully solved by the use of alternating current motors, where the percentage of power required for auxiliary apparatus (exclusive of pumps, etc.) is 25 per cent. or less of the total power delivered to that mill, and where the power factor of the entire mill including both main and auxiliary apparatus is 70 per cent. or over, the authors feel amply justified in saying that the all A. C. system will show a saving in annual cost, to say nothing of its greater simplicity and more satisfactory operation.

The above claims have been the subject of considerable controversy and discussion, but have not as yet been successfully controverted.

Dynamic braking, together with lifting magnets and some other operations, it is impossible to perform with alternating current, but their results can usually be approximated in other ways, although not always with equal satisfaction, and like the majority of engineering questions, the use of one or the other system will depend largely upon the circumstances governing the individual case.

Driving of Roll Trains by Motors

The driving of roll trains by motors is a subject of considerable interest at present and a few words in regard to it might not come amiss. The motor drive of reversing mills has not met with favor in this country chiefly because of the excessive cost of the installation and the comparatively low cost of fuel, there having been but one drive of this character installed, but with the probable decreased cost of installation and the certain increased cost of fuel, it will not be many years before this type of drive will have to be given serious consideration.

No one can successfully question that a considerable saving can be shown in efficiency, reliability and cost of operation and repairs by the motor drive of non-reversing roll trains over steam engine drive, so that in most cases the decision of which to use depends entirely on the financial ability of the company to make the investment, since in many cases the same amount of money can be invested in new mills or in improving existing ones and net a larger return; but it is safe to predict that the future will show a large increase in the number of roll train drives equipped with electric motors.

There are some important advantages of such drive that cannot be capitalized and are not generally taken into account. One of these is less breakage of mill spindles and coupling boxes due to the steady torque of the electric motor even when overloaded sufficiently to stall it. An example of this advantage is shown by the fact that during the starting and the first eighteen months' operation of the Gary rail mill but one spindle and no coupling boxes or roll wabblers were broken, and an examination of the broken spindle showed such a flaw in the casting as to cause wonder at its not breaking when driving the empty mill, instead of actually having rolled steel for several weeks.

What Power Indicating Instruments Have Done

Another and far greater advantage is the ease with which the power used can be determined. With the

steam engine drive; the chief object has always seemed to be to get the section regardless of the power required either in the friction of the train or work in the passes, the only limiting feature being the stalling of the engine, whereas with the motor, those loads can all be easily and accurately determined by the wattmeter, and in nearly all existing installations such observations have resulted in greatly decreasing the power requirements. One of the first electrically driven mills in this country had the train set up and aligned in accordance with the generally accepted steam-engine-driven practice. The resulting friction load was a great surprise and after adjusting the roll bearings, that train was found to roll steel with less power than was required for the original friction load.

In another case, the total power required to roll steel was reduced from 82 to 51 kw.-hr. per ton of finished product by a study of the power required as shown by the wattmeter. The decreased power requirements also results in a considerable saving due to less mechanical wear on the rolls, spindles, pinions, etc., also in reducing delays due to breakdowns, and although the amount of such earnings cannot be estimated, their advantage should be taken into consideration.

If the improvement in electrical apparatus by the manufacturing companies has rendered possible its economical use in the iron and steel industry, that industry has also been of great assistance to the manufacturer in aiding him in its design and finding uses for its output, but the steel works electrical engineer should bear in mind that while practically all mill and furnace machinery can be electrically driven, there are many cases where more economical and satisfactory results can be obtained by the use of steam, air or hydraulic power, and that the application of electricity against these forms of power, like the choice between gas engines and turbines or between A. C. and D. C. motors, should be the subject of careful study and investigation, so that the overall efficiency of the works, as shown by its earning capacity on the investment, shall be a maximum.

National Implement & Vehicle Association

The nineteenth annual convention of the National Implement & Vehicle Association was held at Hotel Statler, Cleveland, Ohio, last week, closing a three days' session October 25. There were about 400 present, including wives of members and representatives of allied industries. F. C. Johnson, American Seeding Machine Company, Springfield, Ohio, presided. Addresses were made by Dr. E. A. Rumely, general manager M. Rumely Company, Laporte, Ind., on "The American Manufacturer and Industrial Education," and by Franklin H. Wentworth, secretary of the National Fire Protection Association, on "Fire Protection." Robert J. Young, Illinois Steel Company, gave a stereopticon lecture on "Safety." Officers for the year were chosen as follows: President, William Butterworth, Deere & Co., Moline, Ill.; treasurer, H. N. Wade, U. S. Wind Engine & Pump Company, Batavia, Ill.; chairman of the Executive Committee, J. A. Craig, Janesville Machine Company, Janesville, Wis. An Executive Committee was also elected as well as a number of vice-presidents. Peoria, Ill., was chosen as the place for holding the next convention. The proceedings closed with a banquet Friday evening, at which Charles Nagel, Secretary of the Department of Commerce and Labor, spoke.

The annual meeting of the Auxiliary of the National Implement & Vehicle Association, the object of which is promotion and entertainment, was held Thursday afternoon. Officers for the year were elected as follows: President, S. D. Latty, Kirk-Latty Mfg. Company, Cleveland; first vice-president, Louis M. Henoch, A. M. Castle & Co., Chicago; second vice-president, H. C. Ware, Sherwin-Williams Company, Cleveland; third vice-president, W. H. Eaton, American Sheet & Tin Plate Company, Chicago; chairman Entertainment Committee, J. F. Donahue, Russell, Birdsall & Ward Bolt & Nut Company, Chicago; chairman Membership Commitee, William A. Mitchell, Joseph T. Ryerson & Son, Chicago; secretary and treasurer, E. J. Baker, Farm Implement News, Chicago.

The Youngstown Iron & Steel Company, Youngstown, Ohio, was represented at the convention with an exhibit of pressed steel implement shapes. The Cleveland Steel Tool Company, Cleveland, had an exhibit of punches, dies, rivets, etc.

August Iron and Steel Exports and Imports

The report of the Bureau of Foreign and Domestic Commerce, Department of Commerce and Labor, for August, shows a further increase in both the exports and imports of iron and steel as compared with the figures for July. The total value of the exports of iron and steel and manufactures thereof, not including iron ore, in August, was $25,450,107, against $24,913,052 in July, while the value of similar imports was $2,549,115 in August, against $2,476,741 in July.

The exports of commodities for which quantities are given total 282,836 gross tons in August against 272,898 tons in July and 177,900 tons in August, 1911. The details of the exports of such commodities for August and for eight months ended with August, compared with the corresponding periods of the previous year, are as follows:

Exports of Iron and Steel

	August		Eight months	
Commodities	1912 Gross tons	1911 Gross tons	1912 Gross tons	1911 Gross tons
Pig iron	23,994	8,801	172,697	85,378
Scrap	10,771	6,158	72,962	57,596
Bar iron	2,261	1,294	13,264	12,301
Wire rods	4,899	1,536	42,123	11,695
Steel bars	22,547	11,619	128,362	82,797
Billets, ingots and blooms, n.e.s.	34,699	12,005	199,947	161,424
*Bolts and nuts	2,226	.....	†3,776	.....
‡Hoops and bands	1,236	740	6,886	†1,055
*Horse shoes	68	.....	†189	.....
Cut nails	655	1,278	7,432	7,155
Wire nails	7,466	3,227	51,735	33,060
xRailroad spikes	1,605	.....	†2,185	.....
All other nails, including tacks	344	1,164	6,952	8,512
Pipe and fittings	18,334	18,362	172,270	130,147
§Radiators and cast iron house heating boilers	803	474	3,066	2,344
Steel rails	41,147	41,879	312,894	311,732
¶Galvanized iron sheets and plates	14,125	8,613	†28,389	73,028
¶All other iron sheets and plates	3,352		115,751	
¶Steel plates	24,154	19,804	†150,721 †49,430	146,183
¶Steel sheets	10,857		†17,563	
Structural iron and steel	27,639	16,508	192,324	142,173
Tin and terne plates	5,934	5,804	60,100	36,495
Barb wire	8,631	7,576	62,951	54,282
All other wire	15,089	11,058	104,657	83,353
Totals	282,836	177,900	1,978,626	1,441,710

*Included in "all other manufactures of iron and steel" prior to July 1, 1912.
†Figures cover period since July 1.
‡Included in "all other manufactures of iron and steel" from July 1, 1910, to June 30, 1911.
xNot separately stated prior to July 1, 1912.
§Included in "all other manufactures of iron and steel" prior to July 1, 1910.
¶Figures are for six months, January to June, inclusive.

The imports of commodities for which quantities are given total 20,572 gross tons in August, as compared with 17,902 tons in July and 19,746 tons in August, 1911. Details of such imports for August and for eight months ended with August, compared with the corresponding periods of the previous year, are as follows:

Imports of Iron and Steel.

	August		Eight months	
Commodities	1912 Gross tons	1911 Gross tons	1912 Gross tons	1911 Gross tons
Pig iron	13,067	10,447	77,671	107,999
Scrap	1,778	851	11,373	13,423
Bar iron	1,416	2,699	16,793	19,195
Billets, bars and steel plates, n.e.s.	1,316	3,971	12,100	21,366
*Structural iron & steel	188	65	1,584	†282
Sheets and plates	593	138	2,439	1,548
Tin and terne plates	244	293	1,296	12,662
*Steel rails	716	197	2,495	†523
Wire rods	1,254	1,282	9,679	11,284
Totals	20,572	19,746	135,430	188,282

*Included in "all other manufactures of iron and steel" prior to July 1, 1911.
†Figures cover period since July 1.

The imports of iron ore in August were 178,828 gross tons, against 185,677 tons in July and 175,183 tons in the month of August, 1911. The total importations of iron ore for eight months ended with August were 1,358,881 gross tons, against 1,177,896 tons in the corresponding period in 1911.

The total value of the exports of iron and steel, and manufactures thereof, not including iron ore, for eight months ended with August, was $190,411,532, against $159,113,290 in the corresponding period of 1911. The total value of the imports of iron and steel and manufactures thereof, not including iron ore, for eight months ended with August, was $18,509,648, against $20,224,233 in the corresponding period of 1911.

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CONTENTS.

The American Iron and Steel Institute

The American Iron and Steel Institute's third meeting for the reading and discussion of papers, which was held at Pittsburgh last week, gave further proof that the organization is finding itself. The institute started out under the regime of the Gary dinners with a very representative but comparatively small membership, and the scale of entrance fees and dues suggested an intention to keep it limited. There was an impression abroad, also, that discussions on commercial and technical questions were secondary to the promotion of such co-operation among steel manufacturers as would steady prices and conserve earnings. But as time went on, the leaders of the institute began to develop its activities on educational lines. A growing public sentiment against the institute's special form of co-operation may have had something to do with this. An influence was no doubt exerted also by a hostile congressional investigation of the Steel Corporation and the Gary dinners.

At all events, the development of the new policy of the institute has fallen out well for the steel industry. It is the only iron and steel organization in the world in which questions of markets and of trade practice have an equal place with metallurgical and other problems of the works. Appropriately, therefore, the membership represents every department of the industry—selling, manufacturing, transportation and accounting; trade and engineering have an equal footing. The contacts made possible by the institute's meetings are thus one of the most valuable features of its work. Men from different departments get an acquaintance that is bound to be broadening. Young men coming up in the business have opportunities to meet the leaders that they would probably get in no other way. It is worth something to a capable fellow with his eye on a place higher up, to be under observation in this way by those who have gone to the top. Particularly the man who prepares a paper for a meeting of the institute is apt to attract attention to his capabilities from men who ordinarily are not found at engineering society meetings.

The fact that presidents of the large steel companies are actively interested in the success of the institute will insure the preparation of some papers not ordinarily available to the purely engineering societies. What operating departments would gladly exploit has often been withheld because the management thought secretiveness the better policy. One of the papers read at Pittsburgh, for example, dealt with a subject on which publicity had been refused only a few months before.

Excellent as the programmes of the last three meetings of the institute have been, they are certain to be improved. Papers of 5000 to 6000 words will not be read in full, as is now done, and more of an effort will be made to have the papers discussed from the floor. Printed copies will be in the hands of the members in advance of the meeting so that they may be ready with comment.

The American steel industry is most fortunate in the fact that the manufacturers' meetings of 1908-10 furnished the nucleus for so important an organization, one that has come into existence so nearly full grown. The placing of dues on a popular basis has attracted many members and will bring in many more, and the advance of the institute to influence and larger usefulness should be rapid.

The Best Salesmanship in Iron and Steel

One of the interesting papers read at the Pittsburgh meeting of the American Iron and Steel Institute dealt with the Carnegie Steel Company's technical school for salesmen. The details of the course and the procedure followed were fully explained by D. M. Camp, whose paper is given on other pages. The plan, in brief, is to bring junior salesmen to Pittsburgh for six weeks and in that time to give them a certain acquaintance with blast furnace, steel works and rolling mill operations. Preliminary to this is a course of study in the metallurgy of iron and steel and in addition to the trips through the mills there is instruction at Pittsburgh in the form of lectures, supplementing the explanations given while the mill operations are under inspection. There is also review work, and examinations are required at the end of the course, the standing of each of the young salesmen being communicated to the head of the office from which he comes.

Such a course of training, brief though it is, is a considerable step in advance of the old way of acquainting a salesman with the processes of manufacturing what he sells by an occasional trip through a mill. It will do much more if it starts the salesman on lines of study that are followed up after he leaves the temporary training school. Perhaps too much ought not be expected in this direction, however, as the salesman's life, as a rule, is not conducive to the studious habit.

It is very evident that the day of the old-time salesman, who was long on the arts of approach and persuasion and short on knowledge of the real character of what he sold, is passing if it has not already passed. Entertainment and good fellowship count for less today than at any time, in the selling of iron and steel. Manufacturing consumers, who in some lines are the chief buyers of steel products, know more than they ever did about the quality of products their work demands and they also contrive to know more than ever about the exact character of the steel delivered to them by the manufacturer. The salesman must know more than ever he did about the kind of steel best adapted to his customers' needs and must be able to mediate understandingly between the mill and the buyer.

The paper of E. P. Thomas, president of the United States Steel Products Company, also read at the Pittsburgh meeting, took the view that the ideal salesman is one who has been brought up in the actual operations of the mill. What Mr. Thomas advocated was not that salesmen should have a temporary course in the technics of the mill, good as that plan is, but that sales forces should be actually recruited from operating departments. There are some conspicuous examples of the success of this plan in the steel industry to-day. The president of the country's largest steel corporation is a notable one. One or two other names might be mentioned of men who had successful steel mill careers and who have later won equal successes in directing large affairs, one in particular having negotiated international deals calling for salesmanship of a high order.

It must be said, however, that salesmen having the equipment called for in Mr. Thomas's paper are rare in the steel companies of to-day. The rule is that office training is the usual preliminary to a position in the selling force. One Eastern steel company has had some of the young men in its sales offices spend a year or two in the mill. The same company gives its junior salesmen a correspondence course (supplemented in each case by direction from the head of the local sales office) in business methods, the essentials of contract making and some fundamentals in the law of contracts. One subsidiary of the Steel Corporation has a several weeks' course, taken at two plants—one in the Central West and one in the East—which gives the young salesman a good idea of mill practice by taking actual employment in the works. At the same time, under direction from the central office, he gets instruction in such accounting methods as the salesman ought to know, and some training in the methods of the order department.

The two papers presented at Pittsburgh will have a widespread influence, and more will be heard of the more efficient salesmanship that has come with the other advances made by the large corporations. It may be true that the days of the all-round mechanic are passing, but in the steel trade it is evident that the most successful men in the future will be those of the broadest training.

Larger Earnings of Steel Companies

The improved condition of the steel trade is now making itself manifest financially. For many months, up to the past spring, steel manufacturing companies were having a hard time trying to make both ends meet. Some of the strongest were unable to do this, reporting deficits instead of declaring dividends. Even the United States Steel Corporation, with all its advantages, was for a time unable to earn the dividend on its common stock, and in the first quarter of this year drew on its surplus to the extent of $6,292,134 in giving the holders of its common stock their usual 1¼ per cent. for that period. The great expansion in business this year and the advanced prices which manufacturers have been able to get have completely changed the state of affairs. The financial statements of various companies which have recently been coming out show greatly increased earnings, cheering the hearts of stockholders. Deficits have been turned into surpluses. The Republic Iron & Steel Company, which suspended the declaration of dividends on its preferred stock February 26, has found the state of its treasury warranting the distribution of earnings and has again enrolled itself in the list of dividend payers. The Steel Corporation, with its gratifying report of net earnings for the third quarter amounting to $30,063,512, has not only earned its common stock dividend, but has $2,434,801 to spare, being the largest quarterly surplus reported since that of the third quarter last year. Its quarterly reports of earnings for the past two years have shown the following results, after the payment of dividends on the preferred and common stock:

Quarter ended		Result
September 30, 1910	Surplus,	$11,078,063
December 31, 1910	Surplus,	408,032
March 31, 1911	Surplus,	31,155
June 30, 1911	Surplus,	1,869,177
September 30, 1911	Surplus,	2,745,494
December 31, 1911	Surplus,	89,638
March 31, 1912	Deficit,	6,292,134
June 30, 1912	Surplus,	56,483
September 30, 1912	Surplus,	2,434,801

The vicissitudes of the steel trade are well depicted in this table. The experience of other steel companies may be presumed to have run along closely parallel lines. It is to be hoped that the turning of the corner toward better earnings by all manufacturers has started a long march in that direction.

The Fuel Oil Scarcity

The recent letters from the Standard Oil Company to its customers in the Middle West in which it stated that it was unable to renew any contracts for fuel oil have caused them to take immediate steps toward the installation of apparatus for using other fuel. Not only does the Standard Oil Company decline to renew contracts, which position it has taken in individual cases a number of times in the past year, but it expects to discontinue entirely the sale of fuel oil. Arrangements are being made with customers, however, to provide them with such a supply during the period of changing equipment as will prevent undue hardship.

The industries affected include crucible and open-hearth steel foundries, forge shops, steam generating plants and a large variety of industries using heating furnaces, as, for example, the bolt and rivet plants recently built near Chicago. It is not expected that the more refined oil used for internal combustion engines, for stationary and tractor purposes, will be affected and the price of this oil will continue to make it desirable as a fuel as compared with other sources of power. Brickmakers also are large users of fuel oil for heating kilns.

Some of the recently built open-hearth plants, of which a notable example is that of the American Rolling Mill Company, Middletown, Ohio, were provided with ports suitable for burning producer gas, so that the change from oil can be made with practically no expense for changing the furnaces. In most cases, however, the remodeling of furnace ports will involve large outlays. Crucible steel foundries will feel the change with particular keenness. The ease with which it has been possible to install a crucible steel plant has brought a number of foundries into existence that probably never would have been built as converter or open-hearth plants, and the expediency of continuing may be materially affected by the question of fuel. In some of the more recent types of crucible furnaces to which a large part of the development in small steel castings has been due, the oil burning feature is a special advantage.

In Middle Western territory there is a very general disposition to turn to producer gas or pulverized coal as a substitute for fuel oil. The former has been developed to a status of high efficiency and reliability, and in the burning of fine coal recent experiments using superheated steam have shown satisfactory results.

Opinions in the East are that the shortage of fuel oil is confined to the Middle West and contiguous territory; that the real issue is advanced prices for fuel oil if its use is adhered to, also that the Standard Oil Company is heavily oversold and that consumption of the fuel is running far ahead of the capacity of the oil-handling apparatus. Meanwhile it is certain that, unless all indications fail, the demand for fuel oil will greatly broaden through the introduction of engines of the Diesel type, especially for marine use. Already a large passenger and freight vessel with internal combustion engines has visited the port of New York on her trial trip and many others are building at home and abroad.

The question of fuel oil supply is a problem of the cost of transportation. Fuel oils originating in Mexico, California, Oklahoma, Ohio, etc., are practically confined to use within a relatively limited radius of the source of production in each case except for the advantage of low-cost water transportation. This means that, whatever the curtailment of the local supply in any market, oil can still be had if the necessary freight charge is paid. On one point all concerned agree, and that is that the price of fuel oil is going to be higher everywhere.

United States Steel Corporation's Earnings

Surplus for the September Quarter, $2,434,801

The United States Steel Corporation has issued its statement of earnings, covering its subsidiary companies, for the quarter ending September 30, 1912. It compares as follows with the corresponding quarter of 1911:

	1912	1911
July earnings	$9,322,142	$8,750,467
August earnings	10,583,377	10,710,145
September earnings	10,157,993	10,062,113
Total earnings after deducting all expenses incident to operations, including those for ordinary repairs and maintenance of plants and interest on bonds of subsidiary companies	$30,063,512	$29,522,725
Less charges and allowances for depreciation, viz.:		
Sinking funds on bonds of subsidiary companies and depreciation and extraordinary replacement funds	7,658,049	6,806,568
Sinking funds on U. S. Steel Corporation bonds, viz.:		
Instalments	1,012,500	1,012,500
Interest on bonds in sinking funds	615,498	538,306
Net income	$20,777,465	$21,165,351
Deduct interest for the quarter on U. S. Steel Corporation bonds outstanding	5,683,964	5,761,157
Balance	$15,093,501	$15,404,194
Dividends for the quarter on stocks of the U. S. Steel Corporation, viz.:		
Preferred, 1¾ per cent.	$6,304,919	$6,304,919
Common, 1¼ per cent.	6,353,781	6,353,781
Surplus for the quarter	$2,434,801	$2,745,494
Unfilled orders on hand September 30, tons	6,551,507	3,611,317

The earnings for the quarter ended June 30, 1912, were $25,102,265 and for the quarter ended March 31, 1912, were $17,826,973.

An Advance in Chain

On account of the increasing cost of raw materials, a further advance has been made in chain, the new prices per 100 lb. now in effect being as follows:

3/16 in.	$7.50
¼ in.	4.95
5/16 in.	3.95
⅜ in.	3.40
7/16 in.	3.20
½ and 9/16 in.	3.00
⅝ and 11/16 in.	2.90
¾ and 13/16 in.	2.80
⅞ and 15/16 in.	2.70
1 to 1¼ in.	2.60

Extras for BB

3/16 in.	1.50c.
¼ in.	1.50c.
5/16 in. and larger	1.25c.

Extras for Triple B (BBB)

3/16 and ¼ in.	2c.
5/16 in. and larger	1.75c.

The above prices are for proof coil chain in cask lots, f.o.b. Pittsburgh, freight to destination to be added.

The stove manufacturing plant of J. F. Woodruff & Son, Salem, Ohio, which has been idle for some time, has been sold to Pittsburgh interests and the company will be reorganized under the name of the Woodruff Stove & Range Company. Henry Wyatt will have charge of the plant for the present. Extensive repairs will be made and the company will shortly begin operations. It will manufacture a complete line of coal and gas stoves.

The first sod in the construction of the Port Augusta-Kalgoorlie Railroad, Australia, was turned on September 14. The road is to be 1060 miles in length and will link the eastern and western coasts of that commonwealth.

Mining Engineers at Cleveland

A Successful Meeting Under the Auspices of the Iron and Steel Committee

The Cleveland meeting of the American Institute of Mining Engineers which began its sessions at the Hotel Statler on Tuesday morning, October 29, gave promise of realizing the expectations of its promoters both as to the representative character of the attendance and the value of the papers presented and the interest aroused in them. The local committee, of which D. T. Croxton, president of the Cleveland Furnace Company, was chairman and C. B. Murray, of Crowell & Murray, secretary, had done its work well, and the new Statler Hotel aorded facilities which added to the pleasure of those attending. Also on the local committee were Wm. G. Mather, treasurer, F. B. Richards and S. T. Wellman. The general reception committee was headed by H. A. Barren, of the American Steel & Wire Company.

The first session for the reading of papers began at 10 o'clock Tuesday morning, when Mr. Croxton presented Mayor Newton D. Baker of Cleveland to welcome the members. His address was a pleasant departure from the conventional phrases of such occasions. President James F. Kemp replied fittingly and in referring to what Mayor Baker had said about the working out of the mineral deposits with which the mining engineers of to-day have to do said that as the wall rocks of our fathers had become the workable ores of to-day, so it was entirely likely that present day wall rocks would be the ores of the future. He spoke of the previous meetings of the institute in Cleveland, the first of these being in 1875 and the second in June, 1891. Approximately this first meeting directly under the auspices of the iron and steel committee was held in Cleveland, since it is the unloading port for the iron ore fed to the furnaces of eastern Ohio and western Pennsylvania and other parts of the Central West and the headquarters of the Lake Superior iron ore industry.

The first paper, by Capt. Robert W. Hunt, Chicago, presented details of recent practice in the manufacture and inspection of steel rails, particularly the latter. Bradley Stoughton followed with a paper entitled "Notes on Titanium and the Cleansing Effect of Titanium on Cast Iron." Carl Zapffe, Brainerd, Minn., discussed the geology of the new Cuyuna iron range in Minnesota, and Walter A. Barrows, Jr., Duluth, in a companion paper, described the ore as to its physical characteristics and analysis, and its performance in the blast furnace. Two particularly interesting papers in the last hour of the morning session were by Robert R. Abbott and Mark A. Ammon, Cleveland. The former was a comparison of the action of various carbonizing materials and the latter was an investigation into the relations existing between hardness as measured by the Brinell and Scleroscope methods and depth of carbonization in different kinds of steel hardened under different conditions. Prof. H. M. Howe's paper, "Notes on Ruff's Carbon-Iron Equilibrium Diagram," was presented by Bradley Stoughton.

At the afternoon session the following papers were read: "Blowing in a Blast Furnace," by Ralph H. Sweetser, Columbus, Ohio; "Alloys of Cobalt and Chromium With Other Metals," by Elwood Haynes, Kokomo, Ind.; three papers on "The Manufacture of Coke," by W. H. Blauvelt, Syracuse, N. Y.; Dr. F. Schniewind, New York, and F. E. Lucas, Sydney, Nova Scotia; "The Concentration of Iron Ores," by N. V. Hansell, New York, and "A Novelty in Open Hearth Steel Furnace Practice," by N. E. Maccallum, Phoenixville, Pa.

Social Events and Excursions

One of the pleasant social features of the meeting was a dinner given on Tuesday evening at the Hotel Statler by Charles F. Rand, vice-chairman of the iron and steel committee of the Institute, who has been acting chairman in the past year in the absence of the chairman, Charles Kirchhoff, in Europe. The dinner was in recognition of the work done by Bradley Stoughton, secretary of the committee, in securing so many and so excellent papers for the Cleveland meeting and was also by way of welcome to Mr. Kirchhoff. Of the committee there were present besides Messrs. Rand, Kirchhoff and Stoughton, James F. Kemp, Robert W. Hunt, Felix A. Vogel, F. Schniewind and Henry D. Hibbard. Other guests of Mr. Rand were A. R. Ledoux, Jennings S. Cox, Jr., H. Foster Bain, P. N. Moore, E. G. Spilsbury, C. R. Corning, William Kelly and C. M. Weld.

An informal smoker was held Tuesday evening, and in connection with it the Rogers, Brown & Co. motion pictures "From Mine to Molder" were shown and explained by H. B. B. Yergason, of the Cincinnati office of that company. A banquet was held on Wednesday evening, in which ladies participated. The excursions included a trip to one of the wire mills of the American Steel and Wire Company and a visit to the Cleveland & Pittsburgh Railroad's iron ore docks, where the new Hulett unloading machines with 15-ton grabs were seen in operation.

The Attendance

Up to Tuesday afternoon the register showed the names of the following:

D. T. Croxton, Cleveland
I. F. Lisme, Cleveland
D. A. Lyon, Pittsburgh, Pa.
Henry B. B. Yergason, Cincinnati, Ohio
C. B. Murray, Cleveland
Geo. S. Humphrey, New York
Jennings S. Cox, Jr., Santiago de Cuba
Geo. W. Pfeiffer, Santiago de Cuba
Jos. Struthers, New York
Thos. H. Clagett, Bluefield, W. Va.
S. T. Wellman, Cleveland
J. E. Johnson, Jr., Ashland, Wis.
E. Gybbon Spilsbury, New York
C. R. Corning, New York
W. W. Coe, Roanoke, Va.
Carl Zapffe, Brainerd, Minn.
N. V. Hansell, New York
J. W. Hamilton, New York
N. N. Crafts, Cleveland
Oscar Textor, Cleveland
Edward W. Parker, Washington, D. C.
H. Foster Bain, San Francisco, Cal.
William Rattle, Jr., Cleveland
F. B. Richards, Cleveland
R. B. Sheridan, New York
J. F. Kemp, New York
Charles F. Rand, New York
S. W. Croxton, Cleveland
F. A. Emmerton, Cleveland
James Gayley, New York
J. E. Thropp, Jr., Indiana Harbor, Ind.
H. C. Hale, Cleveland
Wm. Koehler, Cleveland
A. O. Backert, Cleveland
Edgar S. Cook, Pottstown, Pa.
H. G. Dalton, Cleveland
H. M. LaFollette, La Follette, Tenn.
Philip N. Moore, St. Louis, Mo.
Robert Abbott, Cleveland
Mark A. Ammon, Cleveland
James W. Malcolmson, Kansas City, Mo.
John M. Price, Cleveland
S. C. Stillwagon, Cleveland
Fred F. Walther, Cleveland
H. G. Merry, Cleveland
L. E. Dunham, Cleveland
Bradley Stoughton, New York
Charles Kirchhoff, New York
H. O. Chute, New York
S. McC. Marshall, Johnstown, Pa.
E. V. D'Invilliers, Philadelphia, Pa.
Knox Taylor, High Bridge, N.J.
C. M. Weld, Low Moor, Va.
R. H. Sweetser, Columbus, Ohio.
F. Schniewind, Englewood, N. J.
E. J. Longyear, Minneapolis, Minn.
F. G. Jewitt, Minneapolis, Minn.
Arthur I. Braid, New York.
Albert W. Smith, Cleveland.
Charles H. Fulton, Cleveland.
Frank R. Van Horn, Cleveland.
Frederick Laist, Anaconda, Mont.
E. F. Roeber, New York.
Wm. Pecanka, Cleveland.
Edmund Wendel, Cleveland.
H. H. Stoek, Urbana, Ill.
W. H. Blauvelt, Syracuse, N. Y.
Elwood Haynes, Kokomo, Ind.
H. P. Parrock, Buffalo, N. Y.
Henry D. Hibbard, Plainfield, N. J.
Robert W. Hunt, Chicago, Ill.
H. A. Barren, Cleveland.
A. I. Findley, New York.
Felix A. Vogel, New York.
J. M. Sherrerd, Easton, Pa.
Henry H. Hindshaw, Alpena, Mich.
Nason Johnson, Alpena, Mich.
J. B. Livingston, Cleveland.
J. C. Reitz, West Park, O.
Karl E. Volk, West Park, O.
A. R. Ledoux, New York.
J. D. Price, New Straitsville, O.
Edward H. Benjamin, San Francisco, Cal.
William Kelly, Vulcan, Mich.
A. Arluck, Cleveland.
R. P. Bowler, New York.
J. B. Read, Cleveland.
C. L. Wood, Cleveland.
Geo. L. Collord, Sharon, Pa.
Paul O. Menke, Sharon, Pa.
C. A. Bever, Cleveland.
P. A. Fruehauf, Cleveland.
C. A. Schaefer, Cleveland.
Walter Wood, Philadelphia, Pa.
S. H. Pitkin, Akron, O.
W. E. C. Eustis, Boston, Mass.
Augustus H. Eustis, Boston, Mass.
Franklin Playter, Boston, Mass.
R. B. Textor, Cleveland.
Zay Jeffries, Cleveland.

Open Hearth Additions at South Chicago

A considerable addition will be made to the open hearth steel capacity of the Illinois Steel ompany at its South Chicago Works. Two new 50-ton furnaces will be built at the No. 1 open hearth department and a new 300-ton mixer will be installed. Some of the present furnaces will be rebuilt. At Gary a new slabbing mill is under construction.

The Iron and Metal Markets

Rail Mills Sold Far Ahead

Some Contracting for Finished Material for Third Quarter

Steel Making Pig Iron More Active in the Central West—Spot Foundry Iron Working Higher

The extent to which buyers are contracting for deliveries beyond the period of crowded operation which all the mills see ahead of them is not easy to measure. In some lines new contracting is less; in those involving material for railroads and railroad equipment companies it is well sustained.

Some rail mills are now sold up to June. Further rollings for spring track laying are out of the question with the leading mills, but orders keep up in large volume. The St. Paul has just bought 75,000 tons, the Southern Electric Railway of Texas 12,000 tons, the M., K. & T. 16,000 tons and the San Antonio, Uvalde & Gulf 9000 tons. An important export order is 30,000 tons for the Canadian Northern.

Car orders closed in the past week amount to fully 5000, while active inquiries for 12,000 are pending and car companies count up 24,000 more on which bids are about to be asked. The fact that on 2200 cars for the Lackawanna Railroad deliveries are not wanted until August, 1913, illustrates the forehanded efforts of some buyers to get in line, and the length of time crowded conditions are expected to last. One car company has had difficulty in placing 20,000 tons of plates and shapes.

A significant transaction in its bearing on the maintenance of present prices is the order just placed by an important consumer for all its requirements of tin plates, hoops and plates for 1913, at today's contract prices. A number of buyers have placed orders calling for deliveries in the third quarter.

In some of the lighter forms of finished steel consumers are not looking so far forward, and it is obvious that in general the scale of contract renewal, where expirations come December 31, cannot be as liberal as at the very low prices of November and December, 1912. Much depends on the amount of the advances meanwhile. In wire products, for example, they have been moderate—$4 a ton on wire nails; in sheets there is the other extreme, or from $10 to $12.

Sheet mills are well filled up for the winter months and recent advances have become well established. Considerable tin plate business is pending, including about 1,000,000 boxes for Pacific coast salmon packers.

The October total of new structural work is exceeding expectations. The Great Northern and the Northern Pacific have just given the American Bridge Company 9000 tons of bridge work and the Burlington has placed a good sized bridge contract. In New York a 23,000-ton subway contract has been practically closed.

The scarcity of material for early shipment is more acute in plates and bars. For the former 1.60c., Pittsburgh, is as low as the average buyer can do, and from $1 to $3 higher has been paid. At the same time it has happened that under special conditions a quick shipment order has been put through at 1.45c. or 1.50c. The oversold condition of bar mills has been pushing up the price of prompt shipment, and at the same time new demand has been unexpectedly heavy. Sales of hard steel bars for reinforcing have been very large. For prompt shipment soft steel bars have sold at 1.60c., Pittsburgh, and higher. Contract bar iron has advanced to 1.55c. with prompt shipments $2 a ton higher.

The semi-finished steel situation promises no early relief; billet and sheet bar production will not be measurably increased by new open hearth construction before April. For Bessemer sheet bars for first quarter one seller has favored a $26 Pittsburgh basis, but the question is still open. Sales of open hearth billets at Central Western mill have been made at $28 for soft steel up to $35 for forging billets.

In steel making pig iron the market has been more active. Four lots of Bessemer iron, altogether 40,000 to 50,000 tons, have been sold at $17 at Valley furnace. One steel company is in the market for 10,000 tons of basic for this year and for 15,000 to 20,000 tons a month in the first quarter, and sales of 7500 to 8000 tons have been made at $16.25 at furnace.

Foundry iron is quiet, but that market is veering toward higher prices for spot iron than for forward shipment, or the reverse of recent conditions. Canadian buyers are short of iron and there are indications in other directions that the need of iron for this year will grow more urgent. Southern No. 2 iron has sold at $14.50, Birmingham, for first half and some producers consider that level high enough.

Contract blast furnace coke has sold at $3 and as that market grows tighter the extent of its control of pig iron production and price is more marked.

British ferromanganese producers have intimated that the Balkan war may cut down ore supplies and the possibility that consumers in this country will have shipments prorated has put them all at sea as to prices.

The water movement of Lake Superior ore to November 1 exceeds 43,000,000 tons, as against a season record of 42,620,000 tons shipped by water in 1910. A total of over 47,000,000 tons is now predicted, of which the Steel Corporation will bring down 24,000,000 to 24,500,000 tons.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	Oct. 30, 1912.	Oct. 23, 1912.	Sept. 25, 1912.	Oct. 25, 1911.
Pig Iron, Per Gross Ton:				
Foundry No. 2, standard, Philadelphia	$18.00	$18.00	$16.85	$15.00
Foundry No. 2, Valley furnace.	16.25	16.25	15.00	13.25
Foundry No. 2, Southern, Cincinnati	**17.25**	16.75	16.25	13.25
Foundry No. 2, Birmingham, Ala.	**14.00**	13.50	13.00	10.00
Foundry No. 2, at furnace, Chicago*	**17.50**	17.00	16.50	14.35
Basic, delivered, eastern Pa....	18.00	18.00	16.00	14.50
Basic, Valley furnace	**16.25**	16.15	14.75	12.50
Bessemer, Pittsburgh	17.90	17.90	15.90	15.40
Malleable Bessemer, Chicago...	**17.50**	17.00	17.00	14.50
Gray forge, Pittsburgh	16.40	16.40	14.90	13.65
Lake Superior charcoal, Chicago	*18.25*	18.75	17.75	16.50
Billets, etc. Per Gross Ton:				
Bessemer billets, Pittsburgh....	27.00	27.00	24.00	20.00
Open hearth billets, Pittsburgh..	27.50	27.50	24.50	19.00
Forging billets, Pittsburgh.....	34.00	34.00	32.00	24.00
Open hearth billets, Philadelphia	30.00	30.00	28.00	21.40
Wire rods, Pittsburgh.....	**29.00**	28.50	27.00	26.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	18.00	18.00	17.00	13.50
Iron rails, Philadelphia.....	18.00	18.00	17.00	16.00
Car wheels, Chicago	16.50	16.50	14.75	12.50
Car wheels, Philadelphia.....	15.00	15.00	14.25	11.75
Heavy steel scrap, Pittsburgh..	16.25	16.25	14.50	12.00
Heavy steel scrap, Chicago.....	*13.75*	14.25	13.00	9.50
Heavy steel scrap, Philadelphia	15.50	15.50	14.50	11.75

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel, Per Pound to Largest Buyers:	Oct. 30, 1912. Cents.	Oct. 23, 1912. Cents.	Sept. 25, 1912. Cents.	Oct. 25, 1911. Cents.
Bessemer rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.65	1.60	1.47½	1.20
Iron bars, Pittsburgh	1.55	1.50	1.45	1.20
Iron bars, Chicago	1.50	1.50	1.45	1.15
Steel bars, Pittsburgh	1.40	1.40	1.35	1.10
Steel bars, tidewater, New York	1.56	1.56	1.51	1.26
Tank plates, Pittsburgh, future	1.45	1.45	1.40	1.15
Tank plates, Pittsburgh, prompt	1.60	...	...	...
Tank plates, tidewater, New York, future	1.61	1.61	1.56	1.31
Tank plates, tidewater, New York, prompt	1.76	...	...	...
Beams, Pittsburgh	1.45	1.45	1.40	1.20
Beams, tidewater, New York	1.61	1.61	1.56	1.36
Angles, Pittsburgh	1.45	1.45	1.40	1.20
Angles, tidewater, New York	1.61	1.61	1.56	1.36
Skelp, grooved steel, Pittsburgh	1.40	1.40	1.30	1.15
Skelp, sheared steel, Pittsburgh	1.45	1.45	1.35	1.25
Sheets, Nails and Wire, Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.25	2.25	2.15	1.85
Wire nails, Pittsburgh	1.70	1.70	1.70	1.60
Cut nails, Pittsburgh	1.70	1.65	1.60	1.50
Cut nails, f.o.b., Eastern mills	1.75	1.70	...	...
Fence wire, ann'l'd, 0 to 9, Pgh.	1.50	1.50	1.50	1.40
Barb wire, galv., Pittsburgh	2.10	2.10	2.00	1.90
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt shipment	4.00	3.75	2.50	1.50
Furnace coke, future delivery	3.00	2.75	2.50	1.55
Foundry coke, prompt shipment	4.25	4.00	2.75	1.80
Foundry coke, future delivery	3.75	3.50	2.75	2.00
Metals, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	17.75	17.75	17.75	12.62½
Electrolytic copper, New York	17.37½	17.62½	17.70	12.50
Spelter, St. Louis	7.35	7.40	7.50	6.20
Spelter, New York	7.50	7.55	7.65	6.35
Lead, St. Louis	4.85	4.90	4.95	4.15
Lead, New York	5.00	5.05	5.10	4.25
Tin, New York	50.00	50.40	50.10	42.05
Antimony, Hallett, New York	9.75	9.75	8.87½	7.70
Tin plate, 100-lb. box, Pittsburgh	$3.60	$3.60	$3.60	$3.40

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.45c. to 1.60c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ⅛ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive fire box steel	.50
Widths over 110 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inc.	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inc.	.50
Cutting to lengths or diameters under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $29 to $29.50. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.50; galvanized, $1.90. Galvanized barb wire, to jobbers, $2.10; painted, $1.70. Wire nails to jobbers, $1.70.

The following table gives the price to retail merchants on fence wire in les sthe carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.65	$1.70	$1.75	$1.80	$1.90	$2.00	$2.10	$2.20
Galvanized	2.05	2.10	2.15	2.20	2.30	2.40	2.80	2.90

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. and over, and zees, 3 in. and over, 1.45c. to 1.60c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in.	1.50 to 1.55
H-beams over 18 in.	1.50 to 1.55
Angles over 6 in.	1.50 to 1.55
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card, Sept. 1, 1909	1.50 to 1.55
Tees 3 in. and up	1.50 to 1.55
Angles, channels and tees, under 3 in. plus full extras as per steel bar card, Sept. 1, 1909	1.50 to 1.55
Deck beams and bulb angles	1.75 to 1.80
Hand rail tees	2.20 to 2.30
Checkered, trough and corrugated floor plates	2.35 to 2.55

Extras for Cutting to Length.

	Cents per lb.
Under 3 ft., to 2 ft. inclusive	.25
Under 2 ft., to 1 ft. inclusive	.50
Under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.60
Nos. 9 and 10	1.65
Nos. 11 and 12	1.70
Nos. 13 and 14	1.75
Nos. 15 and 16	1.80

Box Annealed Sheets, Cold Rolled.

Nos. 10 and 11	1.90
No. 12	1.90
Nos. 13 and 14	1.95
Nos. 15 and 16	2.00
Nos. 17 to 21	2.05
Nos. 22 and 24	2.10
Nos. 25 and 26	2.15
No. 27	2.20
No. 28	2.25
No. 29	2.30
No. 30	2.40

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	2.40
No. 12	2.50
Nos. 13 and 14	2.50
Nos. 15 and 16	2.65
Nos. 17 to 21	2.80
Nos. 22 and 24	2.95
Nos. 25 and 26	3.10
No. 27	3.25
No. 28	3.40
No. 29	3.55
No. 30	3.70

Effective April 18, 1912, the rates for painted and formed roofing sheets, per 100 lb., are based on the following extras for painting and forming over prices for corresponding gauges in black and galvanized sheets:

Corrugated Roofing Sheets by Weight.

Painting.	29	25 to 28	19 to 24	12 to 18
Regular or oiling	...	0.15	0.10	0.05
Graphite, regular	...	0.25	0.15	0.10
Forming.				
2, 2½, 3 and 5 in. corrugated	0.05	0.05	0.05	0.05
2 V-crimped, without sticks	0.05	0.05	0.05	...
⅝ to 1¼ in. corrugated	0.10	0.10	0.10	...
3 V-crimped, without sticks	0.10	0.10	0.10	...
Pressed standard seam, with cleats	...	0.15	0.15	...
Plain roll roofing, with or without cleats	0.15	0.15	0.15	...
Plain brick siding	...	0.20	...	...
3-15 in. crimped	0.20	0.20	0.20	...
Weatherboard siding	...	0.25	0.25	...
Beaded ceiling	...	0.25	0.25	...
Rock face brick and stone siding	...	0.25	0.25	...
Roll and cap roofing, with caps and cleats	0.25	0.25	...	...
Roofing valley, 12 in. and wider	...	0.25	0.25	...
Ridge roll and flashing (plain or corrugated)	...	0.65	0.65	0.65

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

Steel.		*Standard Charcoal Iron.*	
1¼ to 2¼ in.	62	1½ in.	46
2½ in.	64½	1¾ to 2¼ in.	48
2¾ to 3¼ in.	69½	2½ in.	53
3½ to 4 in.	72	2¾ to 3¼ in.	55½
5 and 6 in.	64½	3½ to 5 in.	58
7 to 13 in.	62	Locomotive and steamship special grades bring higher prices.	

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (card weight) in effect from September 10, 1912, one point greater being allowed on merchant weight; iron pipe (full weight), from October 21, 1912:

Steel.			Iron.		
	Butt Weld.				
Inches.	Black.	Galv.	Inches.	Black.	Galv.
⅛, ¼ and ⅜	72	52	⅛ and ¼	67	48
½	76	66	⅜	66	47
¾ to 3	79	71	½	70	57
			¾ to 1½	73	62
			2 and 2½	73	62
	Lap Weld.				
2	76	68	1¼	57	46
2½ to 6	78	70	1½	68	57
7 to 12	76	66	2	69	59
13 to 15	53	..	2½ to 4	71	62
			4½ to 6	71	62
			7 to 12	69	56
	Plugged and Reamed.				
1 to 3, butt	77	69	1 to 1⅛, butt	71	60
2, lap	74	66	2, butt	72	61
2½ to 4, lap	76	68	1¼, lap	55	44
			1½, lap	66	55
			2, lap	67	57
			2½ to 4, lap	69	60
	Butt Weld, extra strong, plain ends.				
⅛, ¼ and ⅜	68	58	⅜	64	53
½	73	67	½	68	61
¾ to 1½	77	71	¾ to 1½	72	63
2 to 3	78	72	2 and 2½	73	64
	Lap Weld, extra strong, plain ends.				
2	74	66	1½	66	60
2½ to 4	76	68	2	67	59
4½ to 6	75	67	2½ to 4	71	62
7 to 8	68	58	4½ to 6	70	61
9 to 12	63	53	7 and 8	64	54
			9 to 12	59	48
	Butt Weld, double extra strong, plain ends.				
½	63	57	½	58	50
¾ to 1½	66	60	¾ to 1½	61	53
2 to 2½	68	62	2 to 2½	63	55
	Lap Weld, double extra strong, plain ends.				
2	64	58	2	56	50
2½ to 4	66	60	2½ to 4	61	55
4½ to 6	65	59	4½ to 6	60	54
7 to 8	58	48	7 to 8	53	43

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Pittsburgh

PITTSBURGH, PA., October 30, 1912.

The new demand for rolled products has quieted down, consumers being pretty well covered over the remainder of this year and through the first quarter. Specifications are still swamping the mills, which are not gaining on deliveries, but on some finished lines are getting still further behind. Many contracts for finished iron and steel placed early in the year at low prices will expire by limitation on December 31, and buyers who desire to place new orders will be confronted with advances ranging from $5 to $15 per ton over what they then paid, and there is likely to be some hesitation in the making of new engagements. However, the mills will carry over into next year a very large tonnage that should have been shipped this year. October is likely to break all records for output and shipments. The unusually mild weather has been an important factor in permitting maximum output. A slowing down in the new demand now would be a good thing for the market. It would allow the mills to catch up somewhat on deliveries, and would also do much to check the tendency to a runaway market, which the leading steel companies have been making strong efforts to avoid. For the first week in several months, we can report a stationary market, prices being no higher but very strong all along the line. The scarcity of cars is causing some concern, but as yet it is not as bad as had been expected.

Pig Iron.—There is a heavy inquiry for basic, Bessemer and foundry iron for first quarter. It is stated that purchases of pig iron by several of the steel companies have been much heavier than generally credited. We can report sales of four different lots of Bessemer iron, all for delivery in first quarter and first half of next year, at $17, Valley furnace, and 7500 to 8000 tons of basic for first quarter and first haf at $16.25, Valley furnace. The Pittsburgh Steel Company is in the market for 10,000 tons of basic for remainder of this year, and 15,000 to 20,000 tons a month for January, February and March. With the present situation in coke and higher prices for ore for next year, a still higher market for pig iron appears reasonably certain. We quote standard Bessemer iron at $17 to $17.25 for either this year or first quarter; basic, $16.25 for prompt, $16.25 for first quarter and $16.50 for first half; No. 2 foundry, $16.25 to $16.50; malleable Bessemer, $16 to $16.25, and gray forge $15.50 to $15.60, all at Valley furnace, the freight rate for delivery in the Pittsburgh district being 90c. a ton.

Billets and Sheet Bars.—Local steel interests, whose output of billets and sheet bars is heavier now than at any previous time, are scouring the market trying to find steel to help out on their contracts, but with very little success. As yet nothing definite has been decided upon as to the price of sheet bars for first quarter, but one leading maker has been quoted as favoring $26 per ton at mill for sheet bars for first quarter delivery, believing this price fair to the mill and to the consumer. Small lots of Bessemer and open-hearth billets are being sold at $27 and higher, and sheet bars are reported to have sold above $28 for reasonably prompt shipment. For shipment at convenience of the mill we quote: Bessemer billets, $27 to $27.50; Bessemer sheet bars, $27.50 to $28; open-hearth billets, $27.50 to $28, and open-hearth sheet bars, $28 to $28.50, f.o.b. mill, Pittsburgh or Youngstown. Forging billets are $34 or higher and axle billets are about $32 to $33, Pittsburgh.

Ferroalloys.—There is no official price on English 80 per cent. ferromanganese for next year's delivery, and it is intimated that when the official price is named it will be very much higher than anticipated by the trade. Carload lots for prompt shipment have sold at $74 to $75, Baltimore, the rate to Pittsburgh being $1.95 a ton. Consumers of ferromanganese are covered by contracts, but are not getting deliveries owing to its scarcity, and it is stated that higher prices will rule in the near future. We note sales of two carloads, or about 50 tons, of 50 per cent. ferrosilicon for November and December delivery at $75, Pittsburgh. We quote 50 per cent. ferrosilicon in lots up to 100 tons at $75; over 100 tons to 600 tons, $74; and over 600 tons, $73, Pittsburgh. The lower grades are firm at $23 for 10 per cent., $24 for 11 per cent. and $25 for 12 per cent., f.o.b. cars at furnace at Jackson, Ohio, or Ashland, Ky. We quote ferrotitanium at 8c. per lb. in carload lots; 10c. in 2000 lb. lots and over and 12½c. in lots up to 2000 lb.

Steel Rails.—Railroads are being advised to send in specifications early for their rails for next year in order to get on the rolling schedules of the mills, and already a very heavy tonnage has thus been entered. The demand for light rails continues very active, the Carnegie Steel Company having received in the past week new orders and specifications for close to 5000 tons. Its three rail mills at Bessemer are running to practically full capacity. The No. 2 rail mill is soon to be torn out and a mill for rolling sections up to 150 lb. is to be installed. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45-lb. sections, 1.25c.; 16 and 20-lb., 1.30c.; 12 and 14-lb., 1.35c., and 8 and 10-lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Wire Rods.—On a recent inquiry for a round tonnage of either Bessemer or open hearth rods, several of the makers refuse to quote, stating they had not the rods to spare. The supply for the open market is very light and prices are higher. A sale of 300 tons, either Bessemer or open hearth, at option of the mill, has been made at $29. We quote Bessemer, open hearth and chain rods at $29 to $29.50, Pittsburgh.

Muck Bar.—The new demand is fairly heavy, but it is difficult to find a mill that has any muck bar to spare. We quote best grades, made from all pig iron, at $32.50 to $33, Pittsburgh.

Skelp.—The mills rolling skelp are filled up for two or three months ahead and the market is very strong. A sale is reported of 6000 to 8000 tons of grooved steel skelp on the basis of about 1.42½c., Pittsburgh. We quote grooved steel skelp at 1.40c. to 1.45c.; sheared steel skelp, 1.45c. to 1.50c.; grooved iron skelp, 1.65c. to 1.70c., and sheared iron skelp, 1.75c. to 1.80c., delivered at buyer's mill in Pittsburgh district.

Structural Material.—Inquiry is heavy, but local fabricators are not bidding on much new work, being so filled up as to be unable to make deliveries wanted. The Riter-Conley Mfg. Company has taken 1000 tons for a freight pier at Philadelphia, and the McClintic-Marshall Construction Company has taken some dry dock gates for the Government at Balboa, about 850 tons. We quote beams and channels up to 15 in. at 1.45c. to 1.50c. for shipment at convenience of the mill, which means not earlier than first quarter and probably second quarter. Small lots for reasonably prompt shipment from warehouse are bringing anywhere from 1.60c. to 1.80c.

Plates.—Some car orders have been placed, and new inquiries are heavy. The Pennsylvania Railroad has ordered 3000 box and 1000 automobile cars from the Pressed Steel Car Company and will build 1000 box cars at its own shops at Altoona, Pa. The Pressed Steel Car Company has also taken about 500 ore cars from the Northern Pacific. The New York Central Railroad has placed orders for 207 passenger, baggage and postal cars, divided among various makers. Inquiries out include 3000 coal cars and 1000 box cars for the Chesapeake & Ohio, which have not yet been placed as reported. The Delaware, Lackawanna & Western is in the market for 2200 cars, the Boston & Maine for 6100, the Elgin, Joliet & Eastern for 1000, the Maine Central for 500, and the Erie and Pacific Fruit Express for 2000 cars. The contract for the San Fernando section of the Los Angeles aqueduct has been placed, the Riter-Conley Mfg. Company, Pittsburgh, taking 4500 tons and the Lacey Mfg. Company, San Francisco, 3700 tons. The plates have not yet been bought, but part will likely go to a Pittsburgh mill if it can make the deliveries wanted. We quote ¼-in. and heavier tank plates at 1.45c. to 1.50c., Pittsburgh, for deliveries in first and second quarters, while for delivery in two to four weeks from date of order 1.60c. to 1.70c. is being readily paid.

Iron and Steel Bars.—The new demand for both iron and steel bars continues extraordinarily heavy and some consumers, who are not getting prompt deliveries from the mills, are buying in the open market and paying from $2 to $5 a ton above what are regarded as regular prices. All the mills are badly oversold and are trying to divide their output as equitably as they can under conditions existing. Leading consumers, such as the steel car builders, wagon builders and implement makers, have placed heavy contracts for both iron and steel bars for delivery through first quarter and first half of next year. The demand this season for hard steel bars for reinforcing purposes has been unusually large. We quote steel bars at 1.40c. to 1.45c. for delivery at convenience of the mill, which means not earlier than first quarter, and in the case of one or two large makers probably second quarter, while for fairly prompt deliveries from 1.60c. to 1.75c. has been paid. Iron bars are higher, and we quote these at 1.55c. to 1.60c., with premiums of $2 to $3 being paid for prompt shipments. Makers of steel bars are quoting $1 extra per ton for twisting bars, ¾ in. and larger, and $2 extra for ½ to ⅝-in.

Sheets.—The market is now firmly established on the basis of the recent advance in prices of $1 on blue annealed and $2 on black and galvanized. Some mills that can ship out sheets within three or four weeks from date of order state they are getting $1 to $2 a ton above the regular market. One leading maker of black and galvanized sheets reports its specifications last week the heaviest in any week in its history. All state that new orders are heavy and consumers are specifying freely against contracts. With actual orders already booked and business in sight, they expect to run to full capacity through the winter months. The market is very firm on the basis, minimum, of 1.65c. for Nos. 9 and 10 blue annealed sheets; 2.25c. for No. 28 black and 3.40c. for No. 28 galvanized, in carload and larger lots f.o.b. mill Pittsburgh, jobbers charging the usual advances over these prices for small lots from stock.

Tin Plate.—Most of the large consumers, such as the meat packers and can makers, have placed their contracts for delivery over first half of next year, but on some of these contracts deliveries will no doubt run into third quarter. There is some demand for tin plate for delivery this year, but only for small lots to round out needed requirements. All the tin plate mills are running practically full. The continued advances in prices of pig tin are given as the reason for a further expected advance in tin plate. The market is firm on the basis of $3.60 per base box for 14 x 20 coke plates for delivery over first quarter and first half of next year.

Hoops and Bands.—New buying is rather quiet, as consumers have pretty well covered for some time ahead. Prices are firm. We quote steel bands at 1.40c. to 1.45c., with extras as per the steel bar card, and hoops at 1.50c., Pittsburgh, for shipment through first quarter.

Bolts and Rivets.—The new demand is fairly heavy. It is stated that all the makers of bolts and rivets have their output over the next two or three months well sold up. We quote button head structure rivets at $2 and cone head boiler rivets at $2.10 per 100 lb., base, in carloads, an advance of 25c. being charged for small lots. For first quarter shipment makers are asking $2.25 for structural rivets and $2.35 for boiler rivets. The new discounts on bolts are as follows, in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coach and lag screws	80 and 10% off
Small carriage bolts, cut threads	75 and 7½% off
Small carriage bolts, rolled threads	75, 10 and 2½% off
Large carriage bolts	70 and 5% off
Small machine bolts, rolled threads	75, 10 and 7½% off
Small machine bolts, cut threads	75, 10 and 2½% off
Large machine bolts	70 and 10% off
Machine bolts with C.P.C. and T nuts, small	75 and 7½% off
Machine bolts with C.P.C. and T nuts, large	70 and 2½% off
Square hot pressed nuts, blanked and tapped	$5.80 off list
Hexagon nuts	$6.40 off list
C.P.C. and R. square nuts, tapped and blank	$5.80 off list
Hexagon nuts ⅜ and larger	$6.70 off list
Hexagon nuts smaller than ⅜	$7.30 off list
C.P. plain square nuts	$5.30 off list
C.P. plain hexagon nuts	$5.60 off list
Semi-finished hexagon nuts ⅝ and larger	83 and 5% off
Semi-finished hexagon nuts smaller than ⅝	85, 10 and 5% off
Small rivets	80 and 5% off

Spelter.—The market continues weak. We quote prime grades of Western at 7.35c., East St. Louis, equal to 7.47½c., Pittsburgh.

Railroad Spikes.—The feature of the market is the scarcity of small spikes, which can hardly be had at any price, several local makers stating they could readily get $2 for small spikes if they had any to spare, but are sold up for two or three months ahead. Railroads are specifying freely against contracts. One leading Eastern road recently sent in specifications for 5000 kegs for first quarter delivery. We quote railroad spikes in base sizes, 5½ x 9-16 in., at $1.80 to $1.85, and small railroad and boat spikes to $1.90 per 100 lb., f.o.b. Pittsburgh, for delivery through first quarter.

Wire Products.—So far the Jones & Laughlin Steel Company and the Cambria Steel Company are the only makers of wire nails quoting on the $1.75 basis for wire nails, the others still naming $1.70. The new demand for wire and wire nails is fairly heavy, and jobbers are specifying freely against contracts. The local makers of wire and wire nails state they have their output well sold up over the remainder of this year. We quote wire nails at $1.70 to $1.75 per keg; cut nails, $1.70 per keg; galvanized barb wire, $2.10 per 100 lb.; painted, $1.70; annealed fence wire, $1.50, and galvanized fence wire, $1.90, f.o.b. Pittsburgh, usual terms, freight added to point of shipment. Jobbers charge the usual advances for small lots from store.

Merchant Steel.—The new demand continues fairly heavy, but consumers have pretty well covered their needs for some time ahead. Output and shipments by the mills this month will be the heaviest in any one month in the history of the trade, but the mills are all back in deliveries from six to ten weeks or longer. Prices are firm and higher and we quote: Iron finished tire, 1½ x ⅜ in. and larger, 1.40c. base; under 1½ in. x ⅜, 1.55c.; planished tire, 1.60c.; channel tire, ¾, ⅞ and 1 in., 1.90c.; 1⅛ in. and larger, 1.80c.; toe calk, 2c. base; flat sleigh shoe, 1.50c.; concave and convex, 1.80c.; cutter shoes, tapered or bent, 2.40c. to 2.45c.; spring steel, 2c.; machinery steel, smooth finish, 1.80c. to 1.85c., all f.o.b. at mill, Pittsburgh.

Shafting.—The new demand is fairly heavy. Specifications against contracts from the implement makers are larger now than for some time. Prices are still maintained on the basis of 60 per cent. off on cold rolled shafting in carload and larger lots, and 55 per cent. in small lots, delivered in base territory.

Merchant Pipe.—Last week the Youngstown Sheet & Tube Company and Spang, Chalfant & Company, Inc., sent out new discounts to the trade on iron pipe and some important changes were made. On ¾-in. butt weld the advance on black was $2 a ton and on galvanized $8 a ton. On 2 in. lap weld, black was advanced $2 and galvanized $4, and on 2½ to 4-in. the same advance was made, but all sizes from 2½ to 6-in. lap weld are now grouped under one discount, this being 71 off for black and 62 for galvanized. The new demand for iron and steel pipe continues heavy. All the pipe mills are very much back in deliveries. Several fairly large inquiries for line pipe are out, but the mills are filled up so far ahead that it is doubtful whether deliveries wanted can be made. Of the inquiry from one of the Standard Oil Company interests in this city for 75 miles of 16-in steel pipe, an order for 45 miles has been placed with a local mill and the other 30 miles will likely go over until next year. Discounts on iron and steel pipe are stated to be fairly well held.

Boiler Tubes.—The new demand for locomotive and merchant tubes is fairly large. One maker of seamless tubes reports being pretty well sold up through first quarter of next year. An advance in prices of charcoal iron tubes is looked for soon on account of the higher prices ruling on plates. Discounts on locomotive and merchant tubes are firmly held.

Coke.—A Connellsville coke operator reports a sale of 4000 tons of standard furnace coke per month over first half of next year at $3 per ton at oven, and states that he has been offered above $3 for 10,000 tons or more per month over all of next year, but has very little to spare. Negotiations are under way on a number of contracts for furnace coke for first half, but furnaces and coke makers seem unable to get together on prices. An Eastern blast furnace is in the market for about 5000 tons of coke per month for first half and has been quoted $3.50, but the business has not been closed. Prompt furnace coke has sold as high as $4 per ton, and we note sales in the past week of more than 5000 tons of prompt furnace coke at prices ranging from $3.85 to $4 per net ton at oven. The situation in coke is serious, more so than is generally realized, and it is doubtful if there will be enough coke to go round during the winter months. This fact is well known to coke makers and they are very firm in their ideas as to prices and are holding for higher figures than the furnaces seem disposed to pay now. Makers of standard furnace coke are asking $3 to $3.50, but while several furnaces would be willing to pay $2.75 they are not inclined to contract above that figure. Prompt foundry coke has sold at $4.25 per net ton at oven, and is very strong. We quote furnace coke on contracts running through first half of next year at $3 to $3.50. Standard makes of 72-hr. foundry coke have sold at $4 to $4.25, and on contracts from $3.50 to $3.75 per net ton at oven. A good deal of capacity for making coke is still idle, but the scarcity of labor is preventing this capacity from being started. The output of coke in the Upper and Lower Connellsville regions last week was 398,000 tons, a slight decrease over the previous week.

Iron and Steel Scrap.—The scrap trade continues active, the demand for heavy melting steel scrap being strong. Reports are that selected grades of steel scrap have sold in the past week as high as $16.50, delivered at buyer's mill. The inquiry for borings and turnings is better, one large consumer who had shut off shipments for some time again taking in material, which has helped the local market very considerably. A heavy demand is observed for bundled sheet scrap. The whole market is ruling strong, with consumption at high tide, and all indications pointing to higher prices in the near future. We note sales of 8000 to 10,000 tons of heavy steel scrap at prices ranging from $16.10, the lowest, up to $16.50, the latter price not having been absolutely verified. We also note sales of 1500 to 2000 tons of low phosphorus steel scrap for first quarter delivery at $18.50; 500 tons of No. 1 busheling at $15.25; 500 tons of turnings at about $11.50, and 700 tons of borings at about $10.25, delivered. Dealers are now quoting per gross ton as follows:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	$16.25 to $16.50
No. 1 foundry cast	15.00 to 15.25
No. 2 foundry cast	14.00 to 14.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	13.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	17.25 to 17.75
No. 1 railroad malleable stock	14.50 to 14.75
Grate bars	11.00 to 11.25
Low phosphorus melting stock	18.50 to 18.75
Iron car axles	26.00 to 26.25
Steel car axles	18.00 to 18.25
Locomotive axles, steel	22.00 to 22.25
Locomotive axles, iron	28.00 to 28.25
No. 1 busheling scrap	15.00 to 15.25
No. 2 busheling scrap	10.25 to 10.50
Old car wheels	16.00 to 16.25
*Cast-iron borings	10.25 to 10.50
*Machine shop turnings	11.50 to 11.75
†Sheet bar crop ends	16.75 to 17.00
Old iron rails	16.50 to 16.75
No. 1 R. R. wrought scrap	15.25 to 15.50
Heavy steel axle turnings	13.00 to 13.25
Stove plate	11.00 to 11.25

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

The Cambria Steel Company has leased 14 rooms on the eighteenth floor of the Oliver Building, Pittsburgh, in which will be installed the traffic and purchasing departments, which are to be removed from Johnstown to Pittsburgh. These rooms were subleased from the Republic Iron & Steel Company, the main offices of which were removed from Pittsburgh to Youngstown more than a year ago. F. C. Yeates is purchasing agent and William A. Sproul is manager of the traffic department of the Cambria Company. W. M'Lain, the Pittsburgh sales agent, will move his offices from the twenty-fourth floor to the eighteenth floor. The offices of W. H. Donner, president Cambria Steel Company, will be removed from the eighth floor of the Frick Building to the new location in the Oliver Building.

The offices of the Washington Coal & Coke Company and of the Hazard Mfg. Company will be removed from the Conestoga Building to the First National Bank Building, Fifth avenue and Wood street, Pittsburgh, about November 1. N. P. Hyndman is sales manager of both companies.

The Weirton Steel Company, organized recently to build a plant at Weirton, W. Va., for the manufacture of cold rolled strip steel and specialties, has opened an office in room 2223 Farmers' Bank Building, Pittsburgh, in charge of S. L. McCormick, secretary.

Chicago

CHICAGO, ILL., October 29, 1912.

With the exception of slight advances in price on some of the less important items of finished steel the past week brought out no essentially new phases in the market situation. General specifications and sales of plates, shapes, bars and rails aggregated the largest total of any week in October, but these figures included matters under negotiation for some time. New business and specifications appeared to some as showing a slight falling off in activity, which if it increases will meet the general expectation for the period immediately before and after election. Among the rail contracts closed during the week, of which some 45,000 tons is noted below, were 12,000 tons of traction rails and 3000 tons of Mayari Bessemer rails. In addition to previous car inquiries a total of 6000 is in the market for prices from two Western roads, and one of the Harriman lines expects to increase its equipment by another 6000 cars. Fabricated steel contracts are light, with the exception of the new Stevens store, for which 7000 tons will be required. Prices of sheets are higher, both from mill and store. The pig iron market is quiet, but prices are being maintained with decided firmness, and local iron is now well established on the minimum basis of $17.50, f.o.b. furnace. The local scrap market experienced a sharp relapse, accompanied by a general reduction of about 50c. a ton, as the result of an over aggressive campaign to move material in excess of consumers' needs. The liquidation seems not entirely completed, and until the balance is restored a recovery appears unlikely.

Pig Iron.—Buying the last week has been in small volume compared with the past. The fact that a national election is close at hand may have some influence in lessening the immediate demand. Inquiries are scarce and only one of large size is reported, that being from a St. Louis steel foundry which has been in the market for 15,000 tons of basic iron. None of the Southern furnaces is in a position to figure on this inquiry, and prices at Ohio furnaces are not attractive in competition with the $17.50 price quoted for Northern basic at local furnaces. A transaction in Southern No. 2 iron at $14.50 for the first half of 1913 is reported, and a sale of 300 tons of another Birmingham iron has been made at the same price, f.o.b. Birmingham. For prompt shipment and first quarter delivery the market continues at $14, and local iron is very firm at $17.50, furnace. The minimum for Ohio 8 per cent. silvery iron is now $21.40, with a premium of 50c. for first quarter and an additional 50c. for second quarter. The coke situation is still an an important factor in the melting of pig iron, the ruling price being $4 at Connellsville ovens, while, as reported last week, $4.50 has been paid for spot shipments. We quote local irons, f.o.b. furnace, the average switching charge to Chicago foundries being nearly 50c. a ton. Other quotations are for Chicago delivery. Prices on prompt shipment are as follows:

Lake Superior charcoal, No. 1, 2, 3, 4	$18.25 to $19.25
Northern coke foundry, No. 1	18.00
Northern coke foundry, No. 2	17.50
Northern coke foundry, No. 3	17.00
Northern Scotch, No. 1	18.00
Southern coke, No. 1 foundry and No. 1 soft	18.85 to 19.35
Southern coke, No. 2 foundry and No. 2 soft	18.35 to 18.85
Southern coke, No. 3	17.85 to 18.35
Southern coke, No. 4	17.35 to 17.85
Southern gray forge	16.85
Southern mottled	16.85
Malleable Bessemer	17.50
Standard Bessemer	19.40
Basic	17.50
Jackson Co. and Kentucky silvery, 6 per cent.	20.40
Jackson Co. and Kentucky silvery, 8 per cent.	21.40
Jackson Co. and Kentucky silvery, 10 per cent.	22.40

Rails and Track Supplies.—Orders for rails aggregating nearly 45,000 tons were placed in this market the past week. Of these the most important was that of the Missouri, Kansas & Texas for 16,000 tons. The Southern Electric Railway of Texas bought 12,000 tons of traction rails. The San Antonio, Uvalde & Gulf ordered 9000 tons and the Terminal Railway at St. Louis 4200 tons. The Père Marquette, in addition to the 12,000

tons previously reported, has taken 3000 tons of Mayari Bessemer rails. We quote standard railroad spikes at 1.90c. to 2c., base; track bolts with square nuts, 2.20c. to 2.30c., base, all in carload lots, Chicago; tie plates, $30 to $32.50 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The demand continues on a scale that is considerably in excess of the output of the mills. The railroads are still heavy buyers of structural shapes for locomotives and cars. The Illinois Central Railroad has authorized the purchase of 6000 freight cars, but there have been no tangible developments in connection with this anticipated purchase. The Missouri, Kansas & Texas is in the market for 4000 cars and the Missouri Pacific is making inquiries with a view to placing an order for 2000. Several other roads are said to be in the market, the Chicago & Northwestern requiring 2000 box cars, the Northern Pacific 4000 box and 1500 refrigerator cars, the Grand Trunk 100 passenger coaches, the St. Louis, Rocky Mountain & Pacific 500 steel underframes, and the Canadian Pacific 1000 box and 100 miscellaneous cars. Inquiries are being made for 7000 tons of steel for the new building to be constructed in Chicago for Charles A. Stevens & Bros., retail merchants. Contracts for fabricated material placed the past week include 595 tons for the Brockman Building, Los Angeles, Cal., awarded to the Pacific Rolling Mill Company; 430 tons for a mill building for the Valier & Spies Milling Company, St. Louis, Mo., to Christopher & Simpson; 107 tons for a school at Tacoma, Wash., to the West Coast Steel Works; 215 tons for an exposition building at San Francisco to the Llewellyn Iron Works, and 200 tons for a high school at Rockford, Ill., to the Rochester Bridge Company. We quote for Chicago delivery, mill shipment, on plain shapes, 1.63c. to 1.83c.

No small tonpage of structural material is being sold to the various jobbers to balance depleted stocks and meet the requirements of the continued heavy buying out of store. We quote for base sizes, 2.05c.

Plates.—There is no lessening of the buying by railroads of locomotives and cars. The Northern Pacific has purchased 60 locomotives and the Missouri, Kansas & Texas 40. On some contract business, prices as high as 1.50c., Pittsburgh, are being asked, and for prompt delivery 1.60c. and 1.70c. are not unusual. There is little tonnage available, however, for any delivery. We quote for Chicago delivery, mill shipment, 1.63c. to 1.83c.

There is no cessation in demand on jobbers' stocks for plates for early shipment, and in some sizes stocks are exceedingly low. Delivery for plates cut to size is still from ten days to two weeks. We quote for delivery from store, 2.05c. base.

Sheets.—For such tonnage of sheets as local mills are willing to sell the minimum quotations are now 2.53c. for black sheets and 3.68c. for galvanized. Mills are in a somewhat easier position as regards blue annealed, and 1.83c., Chicago, can be done for routine delivery. Quotations for earlier delivery are $1 a ton higher. We quote for Chicago delivery, in carload lots from mill: No. 28 black sheets, 2.53c.; No. 28 galvanized, 3.68c., and No. 10 blue annealed, 1.83c. to 1.88c.

Prices on sheets from store have been advanced $2 a ton without apparently checking the volume of sales. We have revised our prices and quote on sheets from jobbers' stocks as follows: No. 10 blue annealed, 2.25c.; No. 28 black, 2.80c.; No. 28 galvanized, 4.05c.

Bars.—For delivery this year bar iron can be bought at 1.50c., although 1.55c. is a frequent quotation. For contract business running into next year 1.55c. is the minimum price. As the tonnage of steel bars available decreases, the premium for early delivery grows larger, and 1.70c. and 1.75c. are recent prices noted. The contract price for bars continues at 1.40c., Pittsburgh, but most of the mills are desirous of avoiding additional orders. We quote for mill shipment as follows: Bar iron, 1.50c. to 1.55c.; soft steel bars, 1.58c. to 1.65c.; hard steel bars, 1.60c.; shafting in carloads, 60 per cent. off; less than carloads, 55 per cent. off.

Jobbers' stocks of bars are extremely low. The general situation may be illustrated by the shipment of some items from Chicago store into the Pittsburgh district. For delivery from store, we quote soft steel bars, 1.95c.; bar iron, 1.95c.; reinforcing bars, 1.95c. base with 5c. extra for twisting in sizes ¾ in. and over, and 7½c extra for smaller sizes; shafting 55 per cent. off.

Rivets and Bolts.—The demand for rivets is comparatively light, and while the recent advances in prices are in keeping with the prices of bars, concessions seem to be necessary in order to take some of the business offered. The situation admits of reselling rivets at less than the current mill prices and still showing a profit over the basis upon which most of the contracts now in force were made. Some of the marked weakness is attributable to such reselling. We quote from mill as follows: Carriage bolts up to ⅜ in. x 6 in., rolled thread, 75-10-2½; cut thread, 75-7½; larger sizes, 70-5; machine bolts up to ⅜ in. x 4 in., rolled thread, 75-10-7½; cut thread, 75-10-2½; large sizes, 70-10; coach screws, 80-10; hot pressed nuts, square head, $5.80 off per cwt.; hexagon, $6.40 off per cwt. Structural rivets, ¾ to 1¼ in., 1.98c. to 2.08c.; base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets 2.90c. Machine bolts up to ¾ x 4 in., 70-12½; larger sizes, 65-10; carriage bolts up to ⅜ x 6 in., 70-10; larger sizes, 65-5 off. Hot pressed nuts, $5.40, and hexagon, $6 off per cwt.

Cast Iron Pipe.—No large contracts for cast iron pipe have been placed the past week, and current business is largely made up of small orders for repair work. Prices are firm and we quote as follows, per net ton, Chicago: Water pipe, 4 in., $30; 6 to 12 in., $28; 16 in. and up, $27, with $1 extra for gas pipe.

Wire Products.—A very free buying movement prevails. The leading interest adheres to the basis of $1.70, Pittsburgh, for wire nails and painted barb wire, but other interests are practically a unit in asking $1.75, Pittsburgh. Liberal shipments of barb wire are being made on specifications from jobbers and retailers. Farmers are getting through with the work of harvesting crops and are building fences, creating a good demand for barb wire, plain wire and fabricated fencing. We quote plain wire No. 9 and coarser, base $1.68 to $1.73; wire nails, $1.88 to $1.93; painted barb wire, $1.88 to $1.93; galvanized, $2.28 to $2.33; polished staples, $1.88 to $1.93; galvanized, $2.28 to $2.33, all Chicago.

Old Materials.—At the crest of the heaviest buying and selling movement in scrap iron known in some time the market has become flooded with more old material than consumers were willing to buy and prices have declined 50c. a ton. Dealers with heavy stocks on their hands became anxious to sell. This first sign of a softer market brought additional scrap iron in from country dealers, causing a supply much greater than the mills, with their yards already well crowded, have been able to handle. Railroads are offering an aggregate of 8500 tons distributed as follows: Rock Island, 4500 tons, of which 1000 tons is No. 1 railroad wrought; New York Central Lines, 300 tons, and the Chicago & Northwestern, 3500 tons, of which 600 tons is rerolling rails. We quote for delivery at buyer's works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	$18.00 to $18.50
Old steel rails, rerolling	16.25 to 16.75
Old steel rails, less than 3 ft	14.50 to 15.00
Relaying rails, standard section, subject to inspection	24.00
Old car wheels	16.50 to 17.00
Heavy melting steel scrap	13.75 to 14.25
Frogs, switches and guards, cut apart	13.75 to 14.25
Shoveling steel	13.50 to 14.00
Steel axle turnings	11.00 to 11.50

Per Net Ton.

Iron angles and splice bars	$16.50 to $17.00
Iron arch bars and transoms	17.25 to 17.75
Steel angle bars	13.00 to 13.50
Iron car axles	21.75 to 22.25
Steel car axles	17.75 to 18.25
No. 1 railroad wrought	13.75 to 14.25
No. 2 railroad wrought	12.75 to 13.25
Cut forge	12.75 to 13.25
Steel knuckles and couplers	12.50 to 13.00
Steel springs	13.25 to 13.75
Locomotive tires, smooth	14.00 to 14.50
Machine shop turnings	8.75 to 9.25
Cast and mixed borings	7.75 to 8.25
No. 1 busheling	12.00 to 12.50
No. 2 busheling	9.00 to 9.50
No. 1 boilers, cut to sheets and rings	9.75 to 10.25
Boiler punchings	12.75 to 13.25
No. 1 cast scrap	13.75 to 14.25
Stove plate and light cast scrap	11.50 to 12.00
Railroad malleable	13.75 to 14.25
Agricultural malleable	12.00 to 12.50
Pipes and flues	11.25 to 11.75

Philadelphia

PHILADELPHIA, PA., October 29, 1912.

Somewhat quieter conditions are observed in most branches of the iron and steel trade. A disposition is noticeable on the part of some buyers to hold back until after the election. Price fluctuations appear less pronounced. Transactions in pig iron have been in smaller volume. Further purchases have been made of iron ore for next year's delivery. Finished material mills are well sold up and deliveries are the all-important factor. Premiums for early delivery are being more freely paid. Mill activities are still hampered

by the scarcity of labor, while consumers are pressing for deliveries. The old material market is quieter, although prices continue strong.

Iron Ore.—Sales aggregating some 25,000 tons of New Brunswick ore, for delivery in 1913, are reported, while further negotiations for a round lot of Wabana ore, also for next year's delivery, are pending. Negotiations for moderate quantities of domestic ore are also under way. European ores are practically excluded, owing to high ocean freights and the scarcity of bottoms for transportation. The market is exceedingly strong in all grades. Importations during the week include 4850 tons from Cuba and 9300 tons from New Brunswick.

Pig Iron.—While considerable effort is being made by consumers to place contracts for extended delivery, in instances over the third quarter and last half of next year producers show no disposition to sell so far ahead. The majority of furnaces are sold up for the remainder of this year and have but a limited tonnage to offer for first quarter shipment, while the uncertainty of the coke supply, the higher ore prices and the labor shortage make quotations for extended delivery somewhat uncertain. Current business has been confined principally to moderate sized lots for prompt or first quarter shipment. The Pennsylvania Railroad, which has had first quarter requirements for its Altoona shops under consideration, is reported to have closed for the maximum quantity—5200 tons of coke and charcoal foundry grades. No further large sales of low grade iron have been reported to cast iron pipe makers, although several Delaware River melters are in the market. Off grade iron for near future delivery is now comparatively scarce, and as high as $17.50, delivered, is being quoted by some producers. In the higher grades of foundry iron business has been largely of a miscellaneous character. Prices vary considerably and while $18, delivered here, has been done for some brands of No. 2 X foundry, sales have also been made at $18.25, $18.35 and $18.50, delivered, for shipment over the remainder of the year. At the inside quotation the quantity available is limited and many consumers pay higher prices for brands regularly used rather than change to others at light concessions. Virginia producers are now practically all on a basis of $16, furnace, for No. 2 X foundry for this year and first quarter of 1913, and moderate sales have been made on that basis. This is equivalent to $18.80 to $19, delivered here. Rolling mill forge iron has been sold in moderate lots for early delivery at $17.50, delivered here, although some sellers are now holding at materially higher prices. While there is still some inquiry for basic iron for near future as well as early 1913 delivery, no sales are reported. Producers of basic are now quoting $18, delivered, as a minimum for this grade, while $18.50, delivered, is named by some makers. Round lot sales of low phosphorus pig have been made at steadily advancing prices; one lot of 3000 tons was sold on the basis of $23, delivered, while later sales have been made at $23.50, delivered here, which now represents the minimum, although as high as $24 has been quoted. While the upward tendency of prices appears less pronounced, the market is extremely strong in that producers have but little iron to offer. The following range of prices is named for delivery in buyers' yards in this district during the remainder of the year, an advance of 50c. a ton usually being quoted for first quarter shipment:

Eastern Pennsylvania No. 2 X foundry	$18.00 to $18.50
Eastern Pennsylvania No. 2 plain	17.75 to 18.00
Virginia No. 2 X foundry	18.80 to 19.00
Virginia No. 2 plain	18.55 to 18.75
Gray forge	17.50 to 17.75
Basic	18.00 to 18.25
Standard low phosphorus	23.50

Ferroalloys.—Eighty per cent. ferromanganese has been sold in this district in moderate lots for delivery over the second half of next year at $61, seaboard. This quotation also rules for second and third quarter, while first quarter delivery commands a premium, in instances ranging up to $5 a ton. For prompt shipment the quotation of $75, seaboard, has been named, with no sales as yet. While some business in ferrosilicon is under negotiation no sales are reported and quotations of both 50 per cent. and furnace grades are unchanged. Importations of ferromanganese at this port last week aggregated nearly 3000 tons, mostly applying against contracts.

Billets.—Delivery is the important factor. Eastern mills have little steel to offer, either for early or first quarter shipment, and in instances are refusing to quote against inquiries, which are quite numerous, both for prompt, first and second quarter. Premiums are being freely offered for early delivery. Quotations are, to a large extent, nominal, $30, delivered, being used as a basis for basic open hearth rolling billets, with premiums ranging from $2 to $3 a ton, according to customer and delivery. Forging billets are comparatively scarce and prices range from $34 to $40, at Eastern mill.

Plates.—Little diminution in the volume of new business coming to Eastern mills is noted. Deliveries continue to harden and premiums are freely offered for early delivery. While consumers are endeavoring to place business for forward shipment covering the first half of the year Eastern mills accept occasional contracts for first quarter from regular customers, but have not yet opened books for second quarter. Quotations still show considerable variation, although for delivery the remainder of this and the first quarter of next year 1.75c., delivered here, represents the market for sheared and 1.80c. for universal plates.

Structural Material.—New business of any size has not developed very rapidly. Delayed deliveries are probably a factor in this connection. Several large building projects in this district are feeling the effect of non-delivery of materials, even though orders were placed months ago. A very fair volume of miscellaneous business is coming to the mills and some small and moderate bridge work is being figured on by fabricators. Mills continue exceedingly busy. Plain structural shapes for ordinary delivery are quoted at 1.65c., although for early shipment, 1.75c., delivered, is named by mills able to make such delivery.

Sheets.—A very satisfactory demand is reported. Western mills are well supplied with orders and find difficulty in making satisfactory deliveries. Eastern mills are operating at full capacity, and current business, as a rule, continues to exceed daily output. Premiums are freely offered for prompt shipments. Western blue annealed No. 10 gauge sheets are very firm at 1.80c., delivered here, while Eastern mills, making smooth, loose-rolled sheets, readily obtain an advance of ¼c. to ½c. per lb. over that basis.

Bars.—The demand for iron bars appears to be fully equal to the supply, and mills are, as a rule, unable to meet the deliveries asked by consumers. Quotations are very firm at 1.60c. minimum, Eastern mill, equal to 1.65c. to 1.70c., delivered, while 1.75c., mill, has been paid for prompt bars. Steel bars are scarce at 1.55c., delivered in this district.

Coke.—Less activity is noted, due largely to the high prices prevailing for both prompt and contract coke. Foundry coke for prompt shipment has been sold as high as $4.25 at oven, while $4 appears to be the top of the market for prompt furnace coke; $3.85 and $3.90 have, however, been done for this delivery. Little movement in contract coke is reported. A moderate quantity of foundry coke for first half of 1913 was sold at $4 at oven, although $3.75 can be done for some brands. Contract furnace coke has been offered at $3. The following range of prices is named, per net ton, delivered in buyers' yards in this vicinity:

Connellsville furnace coke	$5.20 to $6.20
Connellsville foundry coke	5.95 to 6.45
Mountain furnace coke	4.85 to 5.85
Mountain foundry coke	5.60 to 6.10

Old Material.—Moderate purchases of No. 1 heavy melting steel have been made by several consumers at $15.50, delivered, but buying is not active. Dealers endeavor to hold at $16 for this grade and unconfirmed reports of sales on this basis are heard. There is a moderate movement in rolling mill scrap, but the market is not active. Purchases of stove plate and railroad grates have been made at slightly higher prices. Prices show little change, and the market, while firm, shows a slight tendency to hesitate. The following range of prices about represents the market for deliveries in buyers' yards, eastern Pennsylvania and nearby points, taking a freight rate ranging from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel scrap and crops	$15.50 to $16.00
Old steel rails, rerolling (nominal)	17.00 to 17.50
Low phosphorus heavy melting steel scrap	18.50 to 19.00
Old steel axles	19.00 to 19.50
Old iron axles	25.00 to 26.00
Old iron rails (nominal)	18.00 to 18.50
Old car wheels	15.00 to 15.50
No. 1 railroad wrought	17.00 to 17.50
Wrought iron pipe	14.00 to 14.50
No. 1 forge fire	13.50 to 14.00
No. 2 light iron (nominal)	8.00 to 8.50
Wrought turnings	11.50 to 12.00
Cast borings	11.00 to 11.50
Machinery cast	14.75 to 15.25
Grate bars, railroad	11.50 to 12.00
Stove plate	11.50 to 12.00
Railroad malleable (nominal)	13.00 to 13.50

Cleveland

CLEVELAND, OHIO, October 29, 1912.

Iron Ore.—With an ore movement of approximately 7,000,000 tons in October Lake shipments for the season until November 1 will in all probability exceed the total for the season of 1910 when the Lake movement reached 42,620,000 tons. Shipments this year up to October 1 were 36,338,382 tons, so that the estimated movement to November 1 is over 43,000,000 tons. It is now probable that the Lake shipments of 1912 will reach 47,000,000 tons, or considerably more than estimated early in the year. Several shippers are getting their ore piles well cleaned up and shipments will show a considerable falling off after this week. While some sales made recently were to furnaces that expect to need additional ore before next spring it is known that in other cases furnaces bought some ore to carry over until next season. The interest charged on this ore will be considerably less than the expected advance in prices. We quote prices as follows: Old range Bessemer, $3.75; Mesaba Bessemer, $3.50; old range non-Bessemer, $3.05; Mesaba non-Bessemer, $2.85.

Pig Iron.—Foundry iron continues to move fairly well in small lots, a number of sales being reported for first half delivery. Quite a few buyers are holding back until after election, thinking that then prices may ease off slightly. Large consumers, however, are well covered for their first half requirements. The market is very firm, but local prices are unchanged. One Cleveland producer is still quoting No. 2 foundry at $16.75, furnace, but another that recently advanced its price to $17 has made several sales at the advance for outside shipment. In the valley a leading producer has advanced its price to $17 for No. 2 and has made several sales at that price in lots up to 500 tons. Owing to the high prices prevailing there is little inquiry in this market for Southern iron. Some of the southern Ohio producers have made a further advance in the price of silvery iron for delivery after January 1, now quoting 8 per cent. silicon at $19.50, furnace, for the first quarter and $20 for the second quarter. For the remainder of the year $19 is still being quoted. For prompt shipment and for the first half we quote, delivered Cleveland, as follows:

Bessemer	$17.90 to $18.15
Basic	16.90 to 17.15
Northern No. 2 foundry	16.90 to 17.25
Southern No. 2 foundry	17.85 to 18.35
Gray forge	16.40 to 16.75
Jackson County silvery, 8 per cent. silicon	20.05 to 21.55

Coke.—The market is very firm but quiet. Most of the supply available for spot shipment is said to be in brokers' hands. There is some inquiry for foundry coke contracts. However consumers are unwilling to pay the prices they are being asked. Standard Connellsville furnace coke is quoted at $3.85 to $4 for prompt shipment. For 72-hr. Connellsville foundry coke quotations of $4.25 to $4.50, per net ton at oven, are being made for spot shipment and $4 for contract.

Finished Iron and Steel.—The scarcity of material for early shipment has become more acute. Consumers are paying close to warehouse prices for steel bars, plates and structural material for prompt shipment. Mills are getting further behind on deliveries and are generally turning down requests for contracts for which there is considerable inquiry. Some relief is promised in the next few weeks when consumers get shipments on large stock orders that were placed some time ago. Structural material is harder to secure than other lines for early delivery and there is considerable demand for small lots for prompt shipment. Eastern mills are quoting shapes at 1.55c. for delivery in about 60 days, but are asking an advance of about $4 a ton for early delivery. Owing to the lateness of the season not much structural work is coming out. The American Bridge Company has taken 200 tons for trestles and bins for a coal handling plant for the Lake Shore Railroad at Englewood, Ill. Plates have stiffened up and are quoted at 1.60c. to 1.65c., Pittsburgh, for delivery within the next two months and 1.90c. or higher for prompt shipment. Orders for delivery well into the next year are being taken at 1.45c. to 1.50c. For steel bars 1.40c. is the minimum quotation for delivery at the convenience of the mills. For early delivery premiums of $4 to $8 a ton are being obtained. Bar iron is firm at 1.55c. to 1.60c., Cleveland. Makers of hard steel bars have again advanced prices to 1.45c. for car lots and 1.50c. for less than car lots. Forging billets are exceedingly hard to obtain for early delivery. An Eastern mill offered a few small lots in this market during the week, and they were quickly sold at $35 at mill. Some of the independent sheet mills have advanced prices on black and galvanized sheets $2 a ton and found no trouble in making sales at the advance. We quote sheets at 2.25c. to 2.35c. for No. 28 black and 3.40c. to 3.50c. for No. 28 galvanized.

Old Material.—While a fair volume of business is coming out, the market is not as active as the previous few weeks. Local mills are doing considerable buying in small lots. Valley consumers are offering about 25c. a ton less for heavy steel scrap than a week ago. Dealers generally, however, are holding to recent quotations. The Pennsylvania Railroad and the Wheeling & Lake Erie Railroad have lists out to be closed October 31. We quote f.o.b. Cleveland, as follows:

Per Gross Ton.

Old steel rails, rerolling	$15.00 to $15.50
Old iron rails	17.50 to 18.00
Steel car axles	18.75 to 19.25
Heavy melting steel	14.50 to 15.00
Old car wheels	13.50 to 14.00
Relaying rails, 50 lb. and over	23.00 to 23.50
Agricultural malleable	12.50 to 13.00
Railroad malleable	14.00 to 14.50
Light bundled sheet scrap	12.50 to 13.00

Per Net Ton.

Iron car axles	$20.50 to $21.50
Cast borings	8.50 to 8.75
Iron and steel turnings and drillings	9.00 to 9.25
Steel axle turnings	9.25 to 9.50
No. 1 busheling	12.50 to 13.00
No. 1 railroad wrought	14.00 to 14.50
No. 1 cast	13.00 to 13.50
Stove plate	10.00 to 10.50
Bundled tin scrap	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, October 30, 1912 (*By Telegraph*).

Pig Iron.—The advance in Northern iron to a basis of $16.50, Ironton, for No. 2 foundry opens the way for more Southern iron in this territory. For a while makers in the Hanging Rock district did not keep pace with Southern producers in marking up quotations, but the situation is now somewhat reversed. There is very little inquiry, although small lots of foundry iron to fill in are being taken by a number of melters whose contract shipments were not sufficient to keep up with their requirements, and there is also some new business from others who had not covered for their needs. No general buying movement is looked for until after the election. The scarcity of furnace stocks, both in the North and South, coupled with the steadily increasing consumption, has led to a general prediction of fancy prices for spot iron before the winter is over. Already there are quite a number of furnaces in both sections unable to take on any more business this year and some are sold up to April 1. Among inquiries is one from Indiana for approximately 800 tons of foundry iron for first quarter shipment and an Ohio melter wants an equal quantity for first half. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry and 1 soft.	$17.50 to $18.00
Southern coke, No. 2 foundry and 2 soft.	17.25 to 17.50
Southern coke, No. 3 foundry	17.00 to 17.50
Southern, No. 4 foundry	16.75 to 17.25
Southern gray forge	16.50 to 17.00
Ohio silvery, 8 per cent. silicon	20.20 to 20.70
Southern Ohio coke, No. 1	18.20 to 18.70
Southern Ohio coke, No. 2	17.70 to 18.20
Southern Ohio coke, No. 3	17.45 to 17.95
Southern Ohio malleable Bessemer	17.20 to 17.70
Basic, Northern	17.70 to 18.20
Lake Superior charcoal	19.25 to 19.75
Standard Southern car wheel	25.75 to 26.25

(By Mail)

Coke.—Prompt shipment coke is so scarce that some very fancy prices have been obtained lately. The $4-limit was passed on a small quantity of Connellsville furnace coke. Even first half delivery business is hard to place, as operators have very little coke to sell, and it is predicted that present conditions will prevail for several months to come. The exodus of foreign labor to take part in the Balkan war has been more serious in the coke regions than the daily press indicates, and this has had a tendency to further curtail production, especially in the Connellsville and Pocahontas fields. There is some complaint that deliveries on contracts previously made are not what they should be, but this is readily explained as due to the shortage of cars. We quote 48-hr. Connellsville coke for this year's shipment around $3.75 to $4.25 per net ton at oven, and 72-hr. brands range all the way from $4 to $4.50, but where producers can make prompt shipments it is problematical as to what could be obtained in some cases. Wise County and Pocahontas operators are very indifferent

about taking on new business, and while spot coke is quoted at the same prices as Connellsville, contracts could be made in all three districts for a year's supply at from 25c. to 50c. a ton below the figures named above.

Finished Material.—In some sections a lull is reported, but the excellent weather prevailing continues to bring out an excellent demand for all kinds of structural material. Galvanized sheets also have such a call that the local mill has been able to place a quantity at 3.50c., Pittsburgh basis, for No. 28 gauge, although the regular quotation is 3.40c., Pittsburgh. We continue previous local warehouse quotations of 2.05c. to 2.10c. for steel bars and from 2.10c. to 2.15c. for structural shapes.

Old Material.—The market appears to have struck a soft spot, and prices on many classes of scrap material are expected in some quarters to show a slight decline before the week has passed. It is also predicted that this slack will be taken up later and that even higher levels may be reached before the year has closed. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and that maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$10.75 to $11.25
Old iron rails	15.00 to 15.50
Relaying rails, 50 lb. and up	21.75 to 22.75
Rerolling steel rails	14.00 to 14.50
Melting steel rails	12.00 to 12.50
Old car wheels	13.50 to 14.00

Per Net Ton.

No. 1 railroad wrought	$12.00 to $12.50
Cast borings	8.00 to 8.50
Steel turnings	8.50 to 9.25
No. 1 cast scrap	11.75 to 12.25
Burnt scrap	8.50 to 9.00
Old iron axles	19.00 to 19.50
Locomotive tires (smooth inside)	12.50 to 13.00
Pipes and flues	8.50 to 9.00
Malleable and steel scrap	10.00 to 10.50
Railroad tank and sheet scrap	7.50 to 8.00

Birmingham

BIRMINGHAM, ALA., October 28, 1912.

Pig Iron.—A comparatively uneventful week has gone by so far as pig iron sales are concerned, but the market is as strong at a minimum of $14 as it was 10 days ago. The volume of sales was small. Indications point to fair stocks in hands of users of Southern iron. In addition to this the near approach of the election has had something to do with business. Most transactions involving small amounts were on the $14 to $14.50 basis, the latter being in some instances for the second quarter of 1913. One of the two concerns which have led in the matter of price fixing continues to adhere to the $14.50 minimum and the other to the $14 basis for first quarter with 50c. additional for second quarter. A sale of basic iron at $15 is reported, the reputed customer being especially anxious for a lot, but the sale, if made at all, is not to be taken as a standard price. The Sloss-Sheffield Sheet & Iron Company has blown in its repaired North Birmingham furnace and has one at Sheffield ready for the torch. Production will increase close to the highest record by the middle of November. In addition to the heavy orders for rails placed with the Ensley mill of the Tennessee Coal, Iron & Railroad Company, the order books of the rolling mill at Bessemer are reported as filled to capacity for six months. The Southern Steel & Iron Company is also flush on orders at its steel plant. The heavy demand for basic iron at home is apparently tending to raise the price of that iron for outside shipment when it can be spared by the makers from their own uses. The home consumption by the water and gas pipe makers, which has been very large for months, shows no signs of diminishing. This demand will be decidedly increased in 1913 by the construction at Anniston of the plant of the Lynchburg Pipe & Foundry Company and that of the National Pipe & Foundry Company in Birmingham. With the increased capacity of Southern steel mills and pipe plants, car wheel works, etc., the Birmingham district is commencing to take the lion's share of its pig iron for conversion into finished products at home, and this is going to have a more and more important bearing on the price of Birmingham iron on the outside. Prices f.o.b. cars, Birmingham, are as follows:

No. 1 soft and foundry	$14.50
No. 2 foundry and soft	14.00
No. 3 foundry	13.75
No. 4 foundry	13.50
Gray forge	13.25
Basic	13.50

Cast Iron Pipe.—Reports from pipe works are to the effect that orders previously booked and additional ones constitute the same status as has existed for several months. Shipments are somewhat impeded, but stocks have not begun to accumulate. All shops are busy. Prices continue, f.o.b. cars at Birmingham, as follows, per net ton: 4-in., $25; 6-in. and up, $23; with $1 added for gas pipe.

Coal and Coke.—Coke is in strong demand with movements hindered by scarcity of cars. Furnaces are experiencing some embarrassment in assembling coke at stacks. Prices continue firm at the recent 25c. advance, being now $3.50 to $3.75 per net ton at oven. Some Virginia coke is coming in to foundries. Coal is in such demand that it is measured only by the ability to secure cars to handle it.

Old Material.—All manner of old material is in more or less demand. Steel scrap is a feature and light stove and cast are moving in considerable quantities. The old material men appear to have come into a period of steady good business. Prices f.o.b. cars at Birmingham yards are as follows, per gross ton:

Old iron car axles	$15.50 to $16.00
Old steel axles	14.00 to 14.50
Old iron rails	14.00
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.50 to 11.00
No. 1 country wrought	9.00 to 9.50
No. 2 country wrought	8.50 to 9.00
No. 1 machinery	10.00 to 10.50
No. 1 heavy melting steel	9.50 to 10.00
Tram car wheels	10.00 to 10.50
Light cast and stove plate	8.50 to 9.00
Standard car wheels	11.00 to 12.00

Buffalo

BUFFALO, N. Y., October 29, 1912.

Pig Iron.—Sales of foundry, malleable and basic aggregate 18,000 to 20,000 tons for the week and inquiries are pending for 10,000 to 12,000 tons of foundry and malleable from railroad equipment concerns, soil pipe makers and other consuming interests. One Canadian railroad interest was in the market for 2500 to 3500 tons of malleable and foundry irons for shipment over the next three months; but some difficulty has been encountered in obtaining as prompt deliveries as desired. There appears to be a growing shortage in the supply of coke malleable, some producers being practically out of the market in this commodity, and as a result there has been a considerable demand for charcoal iron at going prices from makers of malleable iron castings as a substitute for coke malleable—to fill in the gap. This extra placement of charcoal irons has already cut down stocks appreciably so that there is not a full assortment of grades at the lower lake ports to last through the winter and there is likelihood of a scarcity, in some brands at least, before the opening of navigation next spring. The price of malleable has advanced 25c. to 50c. per ton and prompt delivery iron in all grades is now commanding a premium of 50c. per ton. Foundries in territory tributary to the Buffalo district are tremendously busy and the demand for quick shipments is becoming more and more insistent. It is expected that Furnace No. 1 of the Rogers-Brown Iron Company will be put in blast about November 15 after completion of relining. This will place all four of the company's furnaces in blast. For first half delivery we quote as follows, f.o.b. Buffalo:

No. 1 foundry	$17.25 to $17.75
No. 2 X foundry	17.00 to 17.25
No. 2 plain	17.00
No. 3 foundry	16.75 to 17.00
Gray forge	16.50 to 16.75
Malleable	17.50 to 17.75
Basic	17.50 to 18.00
Charcoal, regular brands and analysis	18.75 to 21.25
Charcoal, special brands and analysis	22.00

Finished Iron and Steel.—The situation as regards demand in finished materials has shown no let up, which is rather remarkable considering the fact that a Presidential election is only a week away and some quieting down might be expected. Specifications against contracts are fully as heavy as they have been at any time in recent months. So far as new business is concerned, while inquiries for prompt shipment and even for extended deliveries continue in strong volume, mills are disinclined to consider them because of their sold up condition, and practically the only new business that agencies of the leading producers will consider is for shipment at mill's convenience after present obligations are cared for. Very few mills have anything for sale that can be delivered during the remainder of the year and many are fully booked to the end of the first quarter of next year. Consumers who are enquiring for

prompt delivery material are compelled to go to the smaller Eastern mills and to warehouse stocks and pay large premiums for selection from rapidly diminishing stocks. There is continued active demand for billets and other semi-finished steel products; a good portion of this inquiry being from Canadian consumers. No price changes have been announced this week in any line of finished products. Some inquiry is noted for sheet piling, with one or two orders of importance. Lathrop, Shea & Henwood, Buffalo, have received contract for construction of the approaches to the U. S. ship canal lock in Black Rock Harbor, this city, requiring over 800 tons of steel piling, which will be furnished by the Lackawanna Steel Company. Fabricated structural steel shows continued activity. The Eastern Concrete Steel Company, Buffalo, was low bidder for construction of the viaduct approaches carrying the Hamburgh Turnpike, Buffalo, over the city ship canal and the Buffalo Creek Terminal Railroad tracks, for which about 800 tons of steel will be required. The George Kellogg Structural Company, Buffalo, has been awarded contract for the steel for the Allen E. Klopp store and loft building, about 100 tons, and the same company was low bidder for public school No. 57, Buffalo, taking 200 tons. Bids will be called for shortly for bridge work to carry the Erie and the Lackawanna railroads over the Delaware avenue subways in the northern section of this city.

Old Material.—Transactions continue to be of good volume in all the principal grades and dealers report the outlook very encouraging. The local demand for turnings and borings has fallen off, but is equalized by a larger business from outside districts. Prices are well maintained. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$14.75 to $15.25
Low phosphorus steel	17.00 to 17.50
No. 1 railroad wrought	16.00 to 16.50
No. 1 railroad and machinery cast scrap	14.50 to 15.00
Old steel axles	16.75 to 17.00
Old iron axles	24.50 to 25.00
Old car wheels	15.50 to 16.25
Railroad malleable	13.50 to 14.00
Boiler plate sheared	15.00 to 15.50
Locomotive grate bars	11.75 to 12.25
Wrought pipe	10.50 to 11.00
Tank iron	10.75 to 11.25
Wrought iron and soft steel turnings	8.75 to 9.00
Clean cast borings	8.00 to 8.50

St. Louis

ST. LOUIS, MO., October 28, 1912.

The week has shown a slight recession in business and representatives are divided between ante-election conditions and the immediate supplying of wants as the cause for the quiet in the market. Aside from the scrap market there has been no recession in prices. The requirements on old contracts are as insistently urged as ever.

Pig Iron.—The demand has been chiefly in lots below 300 tons, though a number of 500-ton orders have been placed, including one for 500 to 600 tons of low silicon Bessemer, reported sold on a basis of $19.50, St. Louis. The one big sale of the week was of 15,000 tons of Southern basic to a local interest. Specifications on existing contracts continue to exceed expected requirements and the urgency of the demand for prompt shipment shows no abatement.

Coke.—The situation on coke is stiffer than ever, and sales made were on the basis of $4.25 at oven for Connellsville best 72-hr. selected foundry, while as high as $4 was paid for 48-hr. Connellsville furnace coke, both prices being at oven. Virginia foundry coke is quotable here at $3.50 per ton at oven, with $3.25 the last price for 48-hr. furnace coke. Deliveries are the serious thing and are entirely up to the producer's ability to get cars as well as the coke itself. Most of the consumers in this district are behind on their receipts from the ovens. By-product coke is quiet at $6.20 to $6.50 per net ton, St. Louis.

Finished Iron and Steel.—Specifications are larger than ever and the urgency of need, as shown by the requests for prompt shipment, is increasing. The agricultural implement and wagon trade is showing an increased activity each week. In structural material the run of orders was large, but chiefly on small lots, the largest individual contract being 450 tons by the Christopher & Simpson Company for the Vallier & Spies elevator at St. Louis. In steel rails the Terminal Railroad Association of St. Louis took 4500 tons for delivery next year. Some minor sales for special purposes were also made. The light rail market was very active, the coal and lumber interests taking good tonnages. Plates are still hard to get and bars are also urgently sought by consumers. Track fastenings are in excellent request, though the approach of winter is reducing the orders.

Old Material.—There was some softening in the market during the week, though in some items there was an advance, notably in relaying rails, which are hard to get, the dealers' yards being swept clean. The lull in business is chiefly ascribed by the dealers to the natural halt of the last days before the election and is not expected to last longer than a week or two. Dealers are in receipt of lists from the Rock Island aggregating 4000 tons and the Northern Pacific of about the same amount. Both the steel mills and the foundries are still in the market, though without the extreme activity recently noted. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.

Old iron rails	$15.00 to $15.50
Old steel rails, re-rolling	15.00 to 15.50
Old steel rails, less than three feet	14.50 to 15.00
Relaying rails, standard section, subject to inspection	24.00 to 25.00
Old car wheels	15.00 to 15.50
Heavy melting steel scrap	14.50 to 15.00
Frogs, switches and guards, cut apart	14.00 to 14.50

Per Net Ton.

Iron fish plates	$12.50 to $13.00
Iron car axles	20.50 to 21.00
Steel car axles	17.00 to 17.50
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	12.00 to 12.50
Railway springs	12.25 to 12.75
Locomotive tires, smooth	13.00 to 13.50
No. 1 dealers' forge	10.00 to 10.50
Mixed borings	8.00 to 8.50
No. 1 busheling	11.00 to 11.50
No. 1 boilers cut to sheets and rings	8.50 to 9.00
No. 1 cast scrap	12.50 to 13.00
Stove plate and light cast scrap	9.50 to 10.00
Railroad malleable	12.00 to 12.50
Agricultural malleable	11.00 to 11.50
Pipes and flues	8.50 to 9.00
Railroad sheet and tank scrap	8.00 to 8.50
Railroad grate bars	10.00 to 10.50
Machine shop turnings	9.00 to 9.50

Boston

BOSTON, MASS., October 29, 1912.

Old Material.—The market is strong, with prices higher practically all along the line. Machinery cast has finally begun to advance, and dealers look to see it probably $2 higher before a great while. This material has been low and still is when compared with pig iron. The quotations given below are of prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points, taking Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$12.75 to $13.00
Low phosphorus steel	14.00 to 15.00
Old steel axles	15.00 to 15.50
Old iron axles	23.00 to 23.50
Mixed shafting	14.75 to 15.25
No. 1 wrought and soft steel	12.25 to 12.75
Skeleton (bundled)	10.75 to 11.25
Wrought iron pipe	10.75 to 11.00
Cotton ties (bundled)	10.75 to 11.00
No. 2 light	4.50 to 5.00
Wrought turnings	8.50 to 8.75
Cast borings	8.00 to 8.50
Machinery, cast	13.50 to 14.00
Malleable	11.00 to 11.50
Stove plate	9.00 to 9.50
Grate bars	8.00 to 8.25
Cast-iron car wheels	13.50 to 14.00

British Market Conditions Still Strong

American Inquiries for Forge Iron

(By Cable.)

MIDDLESBROUGH, ENGLAND, October 30, 1912.

Balkan influences are still unrelieved. No change has occurred, however, in the pig iron situation, the supply of pig iron being generally scarce. Big American inquiries are being received for forge iron. Stocks of pig iron in Connal's stores are 256,229 tons, against 262,320 tons a week ago. The position of Staffordshire bars is hardly so good as it has been, specifications being wanted by makers. No abatement of strength is seen in semi-finished steel, but demands are being withheld. The German Steel Works Union has sold 44,000 tons of rails to Sweden. The Australia Commonwealth has placed an order for 10,000 tons of rails with the Lithgow Iron Works in that country. We quote as follows:

Cleveland pig iron warrants (closing Tuesday), 66s.

6d., against 66s. 1½d. one week ago, and 65s. 8½d. two weeks ago.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 67s., an advance of 3d. from last week, which was up 6d. from the previous week.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 17s. 6d. for January-March delivery.

German sheet bars, f.o.b. Antwerp, 110s.

German 2-in. billets, f.o.b. Antwerp, 105s.

German basic steel bars, f.o.b. Antwerp, £6 5s., an advance of 1s. from last week.

Steel bars, export, f.o.b. Clyde, £7 15s. to £7 17s. 6d.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £7 7s. 6d., against £7 5s. a week ago.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yard, £8 2s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 15s.

Steel rails, export, f.o.b. works port, £6 15s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 15s. 6d.

(By Mail)

Pig Iron Holds Its Own, Despite the War Situation

MIDDLESBROUGH, ENGLAND, October 19, 1912.

War and rumors of wars have cast a shadow over our markets, but pig iron has held its own very well when the general gloom is considered. A certain amount of selling was, of course, precipitated, even forced, by the debacle in Bourse prices in Paris and Berlin, in both of which centers of financial and speculative activity loans were called in right and left, and stocks carried on margins had perforce to be thrown overboard.

Unquestionably the technical position of the markets has been rendered the more healthy for the drastic purging, and, unless really untoward events develop, the road seems clear for a renewed upward movement. Already there has been a notable recovery in all directions. Statistically pig iron is as sound as a bell, and the big houses in Glasgow that are heavily committed to the rise know this and never waver in their faith that still better times are in store. The run on supplies has been wonderful, the Tees being crowded with shipping waiting turns to load up, and a long continuance of big clearances is regarded as being thoroughly assured.

Caution in Finished Product Buying

Last week's quarterly meeting at Birmingham went off very much as expected—no excitement, no great buying, but a firmly confident tone. Makers do not wish to force the pace, and in this they are undoubtedly acting wisely. Already prices of finished steel and iron stand anything from 20s. to 40s. above the level of a year ago, and it is sound policy not to push them up further until compelled by the exigencies of demand. Some of the Staffordshire ironmasters have been receiving orders from the near East in connection with the mobilization operations, the material principally required being horseshoe iron, for which immediate shipment is required.

Just now, however, the Balkan nightmare is weighing a trifle heavy on the chests of some important consumers, who allege that they will buy no more raw material until the war cloud has dispersed or the Austro-Russian political atmosphere, which they regard as being charged with thunderbolts, has cleared, and in sundry instances inquiries have for this reason been withdrawn. The ultra-cautious people, indeed, take the Continental position very seriously, though the strong probability is that on this occasion they run a grave risk of losing their market by waiting. Whatever happens, it is not likely that the Dardenelles will be closed; unless they are, little harm to British commerce can result, always assuming that the war is confined to the present principals.

A New Record in Shipbuilding

The activity in shipbuilding, to which allusion has been made in previous letters, is attested by Lloyds' returns for the three months ended September 30, which show that excluding war vessels there were on that date 505 vessels of 1,846,000 tons under construction in British yards. This is a record, being 73,000 tons in excess of June 30, and 400,000 tons more than a year ago. Further, there were 82 warships of 494,000 tons building, 12 of which are British.

Considerable interest is attached to the negotiations between Hadfield's Steel Foundry Company and the United States naval authorities regarding a contract for 14-in. steel shells. It appears now that the tender of the Hadfield Company had been accepted, but only for a limited quantity. It is noteworthy, however, that during the last quarter Sheffield actually sent £9,000 worth of steel shells to the United States, which material could hardly have been sent to a private buyer.

The tinplate trade is exceedingly active. The Llanelly mills of Richard Thomas & Co., Ltd., have during the past three weeks created a record, each mill, of which there are eight, producing an average of over 1000 boxes per week. The proprietors of the works are now erecting new steel furnaces.

Germany Feels the Balkan War Slightly

BERLIN, October 17, 1912.

The latest news from steel manufacturing centers indicates that the Balkan War is having no effect thus far; but in some branches of trade manufacturers are rather shy of predicting that there will be no unfavorable results. Reports from Remscheid, where bayonets and swords are manufactured in large quantities, indicate that industries there are already feeling restrictive effects. Several of the shops are so hard hit that they have dismissed a considerable number of their workmen and have given notice to a part of their office force and traveling agents. This change is probably due to the fact that the shops have finished up large orders for the Balkan countries, which have long been preparing for war, and have not yet been able to obtain compensatory orders from other quarters. From Belgium it is reported that manufacturers of steel products are expecting to lose their trade in the Balkans, which is of considerable volume, but orders are so heavy from other countries and from the home trade that the loss from the belligerents may not be felt; in fact, price advances are announced on some products. On the other hand, manufacturers of hardware there have already had to cancel many orders from Turkey and Roumania, their customers having been unable to get accommodations at the banks as usual.

Tendency of Prices Upward

The tendency of German prices is still upward. Band iron was again raised 2 to 3 marks a ton several days ago, and the Luxemburg-Lorraine section of the pig-iron trade is going to advance pig tomorrow about the same figures. This action is taken now because the recent advance adopted by the Essen Syndicate did not include Luxemburg-Lorraine qualities. It will be remembered that the Syndicate, in announcing its new prices, stated that a further advance of 1.25 marks for pig would be made if the Coal Syndicate should advance the price of coke 1 mark. This latter action has just been taken, to go into effect April 1, 1913, and so higher iron prices are to be expected at that time. The machine-tool manufacturers are to meet soon to mark up prices 10 per cent. A report on Luxemburg-Lorraine conditions shows that business continues in a most satisfactory state. Most of the works are fully supplied with orders for the first half of next year and specifications in hand run three to four months ahead. The excellent situation there is largely due to conditions in foreign markets, which take about two-thirds of the product of that district.

The Hardware Trade

According to late news from the hardware trade, the shops are quite generally well employed. This is even true of Remscheid, in spite of the exceptions already mentioned; and the Solingen cutlery trade has much work to do. In the general hardware trade orders run pretty far ahead, in many cases till spring. Some complaints are heard about the high costs of material, which have reduced profits in most lines of goods. For this reason not a few manufacturers believe that the high tide of prosperity is about to ebb. In builders' hardware it is mentioned that the prostration of the building trade at Berlin and some other places is making itself felt in light orders.

The Deutsch-Luxemburg Company has just announced a dividend of 11 per cent., the same as for the two previous years, but upon a capital of 100,000,000 marks, as against 90,000,000 marks. Gross profits amounted to 22,200,000 marks, or 2,260,000 marks more than last year. The Laurahütte in the Silesian district pays 6 per cent. against 4 per cent. The Wittener Stahlröhrenwerke (steel tubes) has been compelled to pass its dividend, after having paid 6 per cent. last year. The Phönix Company is building a new rolling mill at its establishment in Hamm. It will have a capacity of 150 tons daily.

New York

NEW YORK, October 30, 1912.

Structural Material.—Plain material is higher, one large steel company having advanced to 1.50c., Pittsburgh. This will doubtless mean that new material for forward delivery will probably in a few days not be obtainable below this figure. Material for this year and the early part of 1913 brings 1.60c., Pittsburgh, and higher, one round lot on which delivery was urgent being closed at over 1.65c., Pittsburgh. The secretive way in which some work is closed is perhaps more pronounced than ever; two 20-story buildings are in the balance under cover. The volume of business continues large in spite of the season and the proximity of the national election. Awards of steel work for building amounting to tons came to light in large-size projects, as the succeeding list will show, and the 23,000 tons for five sections of the New York subway system reported some time ago were signed up by the American Bridge Company. The awards include: 1100 tons for the Y. M. C. A. building, Park avenue and Fifty-ninth street, to the American Bridge Company; 1400 tons for the United Cigar Stores building, Forty-second street and Vanderbilt avenue, to Levering & Garrigues Company; 2200 tons for the Boston & Albany at Malden, to the Pennsylvania Steel Company; 1275 tons for a hotel at White Sulphur Springs, W. Va., to the Noelke-Richards Iron Company; 400 tons for a brewery stock house, West 127th street, to the George A. Just Company; 300 tons for a building for the American Pulley Company, Philadelphia, to Lewis F. Shoemaker & Co.; 225 tons for an eye and ear hospital, Fifty-seventh street and Tenth avenue, to the Eastern Steel Company; 156 tons for a fire-house on East 156th street, to Mulcahy & Gibson; 200 tons for a cement warehouse at Hudson, N. Y., to the Lane Bridge Company; 225 tons for a freight shed on the North River for the Pennsylvania Railroad, to the Fort Pitt Bridge Works; 225 tons for the Boston & Maine at Somerville and 200 tons for the Pennsylvania to Phoenix Bridge Company; 200 tons for the Boston & Maine at Clinton and 100 tons for the Pennsylvania, to the Pennsylvania Steel Company; 250 tons for a drawbridge, Boston & Maine, to the Boston Bridge Works; 550 tons for the Alberger Pump & Condenser Company. Newburg, N. Y.; 425 tons for the Interborough Rapid Transit on elevated lines and 550 tons for repairs to bridges for the New York Central, to different fabricators, and 100 tons for the Baltimore & Ohio in Chicago territory given to the Cambria Steel Company. The last award is interesting as indicating how far from the place of erection it seemed to be necessary to place the contract. We quote plain material at 1.66c. to 1.71c., New York, for mill shipments for forward delivery; 1.76c. and upward for urgent business; and 2.15c., from store.

Steel Plates.—The market will probably be still more strengthened if possible by the remarkable activity in car buying. The week has seen fewer purchases, but a considerable increase in inquiries. One of the interesting features is that the Delaware, Lackawanna & Western is inquiring for 2200 cars which it does not want until August, 1913, as follows: 1000 box, 500 hopper, 500 gondola and 200 refrigerator cars. In addition to live inquiries mentioned last week may be added 2000 cars for the Rock Island; 3000 center construction for use with existing car bodies, for the St. Paul; and in addition to 7000 to 10,000 expected shortly from the New York Central are 5000 from the Norfolk & Western and at least 6000 cars from another important railroad system. The Pennsylvania Railroad awarded 3000 box and 1000 automobile cars to the Pressed Steel Car Company and decided to build 1000 cars in the Altoona shops, but these were included in last week's totals of business settled. Among other business closed are 3000 box and 1500 refrigerator cars for the Northern Pacific, 300 box for the Louisiana & Arkansas, the latter to the Mount Vernon Car Mfg. Company, and 100 coach, 70 baggage and 8 dining cars for the New York Central to the American Car & Foundry Company, the Barney & Smith Company and the Pullman Company, respectively, being in addition to the coach award mentioned last week. For the rest of the year we quote sheared plates at 1.76c., New York, and universal plates, 1.81c., New York; for forward delivery 1.66c. to 1.71c., New York.

Iron and Steel Bars.—Specifications against contracts continue to hold up and this is true of bar iron as well as of steel bars. It is difficult to get evidence of urgent steel bar business being placed and as yet the bar iron mills do not report much replacement of steel by iron. Mills are pretty generally filled to April 1 and are declining to book business for beyond that date. Steel bars remain nominally at 1.40c., Pittsburgh, or 1.56c., minimum, New York, mill shipments, and from store, 2c. Refined iron bars are 1.60c. to 1.65c., New York, and from store, 2c.

Cast Iron Pipe.—Private buying keeps up in surprising volume for the season, some of which is for delivery next year. No public lettings of importance are announced for this immediate vicinity. Carload lots of 6 in. are held at $24.50 to $25 per net ton, tidewater.

Old Material.—The urgent demand which characterized some branches of the scrap trade is not so much in evidence, although buyers are readily found for almost any kind of old material which holders are willing to dispose of at current prices. While the steel works and rolling mills are generally taking in shipments freely, less inquiry is coming out. The foundries are still somewhat free buyers of cast scrap. The supply of old material has been unusually plentiful this fall, and this has probably had something to do with the attitude of large consumers, who now seem to be getting well supplied. An interesting item of news is that the Chicago Wrecking Company, which has for some time been busily engaged in preparing for the market its purchases of old material along the Panama Canal, will begin to make shipments to this country in the near future. Dealers' quotations, per gross ton, New York and vicinity, are as follows:

Old girder and T rails for melting	$12.75 to $13.25
Heavy melting steel scrap	12.75 to 13.25
Relaying rails	22.50 to 23.00
Rerolling rails	15.00 to 15.50
Iron car axles	23.00 to 24.00
Old steel car axles	17.00 to 17.50
No. 1 railroad wrought	15.00 to 15.50
Wrought iron track scrap	13.50 to 14.00
No. 1 yard wrought, long	13.00 to 13.50
No. 1 yard wrought, short	12.50 to 13.00
Light iron	5.50 to 6.00
Cast borings	9.00 to 9.50
Wrought turnings	9.50 to 10.00
Wrought pipe	12.00 to 12.50
Old car wheels	14.00 to 14.50
No. 1 heavy cast, broken up	13.00 to 13.50
Stove plate	10.25 to 10.75
Locomotive grate bars	10.00 to 10.50
Malleable cast	10.75 to 11.25

Ferroalloys.—The week just passed brought a still more complete withdrawal from the market of some sellers of 80 per cent. ferromanganese and only to the lack of new business can be scribed the absence of an acute situation. Inquiries have been light, but consumers are eager for deliveries on contract and urge that shipments be hurried as much as possible. Quotations range from $71 to $75, Baltimore, for delivery this year and the belief is held that buyers in urgent need would gladly pay these prices or higher. For next year's delivery $61, Baltimore, is asked. Foreign ship owners, profiting by the Balkan war, have taken advantage of a clause in their charters which provides that in case of a European war they may demand higher rates than are specified in their contracts. Consequently, it is costing about double the old rates to land ferromanganese ore in England, even where the ore is brought from Brazil. Of course, the heavy consumption in Great Britain continues to contribute to the situation. Ferrosilicon, 50 per cent., is practically unchanged, the market being quiet with quotations at $75, Pittsburgh, for carloads, $74 for 100 tons and $73 for 600 tons or over.

Metal Market

NEW YORK, October 30, 1912.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead		Spelter	
Oct.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
24	17.75	17.50	50.25	5.00	4.85	7.55	7.40
25	17.75	17.50	50.25	5.00	4.85	7.55	7.40
26	17.75	17.50	.....	5.00	4.85	7.55	7.40
28	17.75	17.37½	50.65	5.00	4.85	7.50	7.35
29	17.75	17.37½	50.25	5.00	4.85	7.50	7.35
30	17.75	17.37½	50.00	5.00	4.85	7.50	7.35

Copper is dull, and the price is lower for resale lots of electrolytic. Tin is quiet, with a slightly weaker tendency. Lead is lower, and the market is inactive. Spelter is down a few points and easy. The activity in antimony has fallen off, but prices are unchanged.

New York

Copper.—The conspicuous feature of the copper market is the offering of resale or speculative lots of electrolytic at considerably lower prices, with an ab-

sence of sufficient demand to take them up. It follows that the market has been very dull, although some unconfirmed reports are heard that sales have been made down to 17.37½c. or lower. The producers, however, continue to hold to 17.75c., 30 days delivered, which they can well afford to do in the absence of substantial demand and the failure to take up second hand lots. Little or no high grade Lake copper is being offered by outsiders. The outcome of foreign conditions is being watched with close interest by metal dealers who are certain that if financial affairs on the other side continue in their present critical state, it will be reflected in the diminished consumption of metals and then back to the demand on American sources of supply. Foreign buying of copper has been reserved of late and exports this month total but 21,453 tons. The falling off in exports causes the Copper Producers' statement to be looked forward to with especial interest. So far as this country is concerned, there is no reason for believing that the liberal rate of consumption lessened any in October. The price in London to-day is £75 for spot and £75 12s. 6d. for futures. The New York price for electrolytic, considering that resale lots make the market, is 17.37½c., and for Lake, 17.75c.

Pig Tin.—The market continues quiet but in the last week there has been a little improvement in the matter of sales. On Tuesday 100 tons of November were sold at prices ranging from 50c. to 50.20c. and 25 tons of December at 50c. This was metal which had been bought some time ago by a dealer who preferred to sell at concessions on its arrival here rather than carry it for a possible better price. The prices at which the tin in question was sold were only relatively low. The Minnewaska arrived yesterday with 1262 tons of November and her cargo furnished the metal on which some contracts were liquidated. There is such a plentiful supply of tin now in this country that competition is a natural sequence. Arrivals this month total 5505 tons and there is afloat 1180 tons. The price in London to-day is £228 15s. for spot and £228 for futures, while the New York price is 50c., having dropped ¼c. as the result of a decline of £1 5s. in London yesterday.

Tin Plates.—There is no change in the local tin plate situation. Reports of an advance in price which were heard in the last week are regarded as improbable by those in the trade in close touch with large tin plate interests. The tendency is toward quietness, and this will continue in all probability until the Presidential election is well out of the way. It is pointed out that if new demand does subside in November, December and January, it will be desirable from the viewpoint of giving the mills a chance to catch up with the orders they have booked.

Lead.—This metal is dull and easy, and while there is plenty to be had buyers are not taking hold. Although there are many offerings at lower prices, the American Smelting & Refining Company sticks to its price of 5.10c., New York. The independent New York price is 5c. and the St. Louis price 4.85c.

Spelter.—The demand is only fairly good and the market tends toward weakness. The New York price is down five points at 7.50c. and the St. Louis price is correspondingly lower at 7.35c.

Antimony.—The demand for this metal, which was the last to partake of the upward trend in prices and activity of the last few weeks, has quieted although prices continue at the higher figures announced a week ago. Cookson's is quoted at 10.50c., Hallett's at 9.75c. and Hungarian and Chinese grades at 9.37½c. to 9.50c.

Old Metals.—Dealers report a more active demand. Selling prices are maintained as follows:

	Cents per lb.
Copper, heavy and crucible	16.75 to 17.00
Copper, heavy and wire	16.50 to 16.75
Copper, light and bottoms	14.75 to 15.00
Brass, heavy	10.50 to 10.75
Brass, light	8.50 to 8.75
Heavy machine composition	14.25 to 14.50
Clean b-ass turnings	9.75 to 10.00
Composition turnings	12.00 to 12.50
Lead, heavy	4.75
Lead, tea	4.50
Zinc, scrap	5.75

Chicago

October 29.—Although there has been something of a flurry in speculative copper, producers are holding to their regular quotations, and little or no metal is obtainable for less. Tin quotations are slightly higher and lead prices while subject to some concessions by the independents are being adhered to without change by the leading interest. Antimony is quoted at higher figures. Sheet zinc is weaker and trading in spelter is dull. We quote as follows: Casting copper, 17.75c.; Lake, 17.87½c. to 18c., in carloads for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 52c.; small lots, 54c.; lead, desilverized, 5c. to 5.10c. for 50-ton lots; corroding, 5.25c. to 5.35c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 7.62½c.; Cookson's antimony, 11.50c., and other grades, 10.50c. in small lots; sheet zinc is $9, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 15.50c.; copper bottoms, 14c.; copper clips, 15c.; red brass, 12.75c.; yellow brass, 10c.; lead pipe, 4.25c.; zinc, 5.50c.; pewter, No. 1, 33c.; tinfoil, 39c.; block tin pipe, 45c.

St. Louis

October 28.—The aggregate business has shown no material change. Lead is quotable at 4.90c.; spelter, 7.40c.; tin, 5.50c. to 5.75c.; Lake copper, 18c. to 18¼c.; electrolytic, 17.90c. to 18.15c.; antimony, Cookson's, 10¾c. In the Joplin ore district the production is still being kept up to a high standard and the basis range on 60 per cent. zinc blende was $53 to $58, with the price of the choicest lots reaching $61 per ton. A few producers are showing a disposition to hold their output for higher prices, but there is an accumulating surplus in the bins, which have been kept clean in past weeks, and that is likely to have a bearish effect on the market. The week's shipments have not been quite so heavy. Calamine brought $29 to $31 for 40 per cent., while the choice grades brought as high as $38. Lead ore was in good demand at $64, with the less desirable lots going as low as $52 for 80 per cent. We quote miscellaneous scrap metals as follows: Light brass, 6½c.; heavy brass and light copper, 10½c.; heavy copper and copper wire, 13c.; pewter, 25c.; tinfoil, 32c.; zinc, 4½c.; lead, 4c.; tea lead, 3c.

Iron and Industrial Stocks

New York, October 30, 1912.

The stock market has been to some extent under the influence of European financial conditions. Transatlantic stock markets have been rather unfavorably affected by the possibility of complications arising from the Balkan war. Until it is definitely settled that the war will not involve any of the great powers the stock market is inclined to nervousness. As the international stocks rise or fall, our domestic stocks fluctuate with them to some extent. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Bald. Loco., com...	56½- 58	Railway Spg., pref..	102 -102½
Bald. Loco., pref...	105½-107¼	Republic, com.....	31 - 33⅛
Beth. Steel, com....	45 - 47	Republic, pref.....	91¾- 93⅜
Beth. Steel, pref....	75 - 76½	Sloss, com.....	55
Can, com.....	40¾- 44¼	Pipe, com.....	19½- 20¼
Can, pref.....	120½-123	Pipe, pref.....	61 - 63¼
Car & Fdry., com...	58¼- 60¾	U. S. Steel, com...	74⅛- 77¾
Car & Fdry., pref...	119 -120	U. S. Steel, pref...	112½-114½
Steel Foundries.....	41 - 43	Westinghouse Elec..	81¾- 83½
Colorado Fuel	34⅜- 39½	Va. I. C. & Coke...	65 - 67
General Electric....	179 -181¾	Am Ship, com.....	57 - 58
Gr. N. Ore. Cert...	45½- 47½	Am. Ship, pref.....	105½
Int. Harv., com.....	120 -122	Chic. Pneu. Tool...	53½- 54⅜
Int. Pump, com.....	27 - 27¼	Cambria Steel.....	51½- 53
Locomotive, com....	41⅜- 43¾	Lake Sup. Corp....	30 - 31
Locomotive, pref....	107 -107¼	Pa. Steel, Pref.....	95 - 98¼
Nat. En. & St., com.	20¾- 22	Warwick	10¾- 11½
Nat. En. & St., pref.	93 - 93¼	Crucible Steel, com.	17 - 17⅝
Pittsburgh Steel. pref.....	103	Crucible Steel, pref.	95 - 97
Pressed Steel, com.	37½- 38½	Harb. Wk. Ref., com.....	50
Pressed Steel, pref..	101½-102⅜	Harb. Wk. Ref., pref.....	102
Railway Spg., com..	36¾- 37½		

Dividends Declared

The J. G. Brill Company, regular quarterly, 1¾ per cent., on the preferred stock, payable November 1.

The Pressed Steel Car Company, regular quarterly, 1¾ per cent., on the preferred stock, payable November 20.

The Standard Sanitary Mfg. Company, regular quarterly, 1 per cent., and an extra of 1 per cent., on the common stock, and regular quarterly, 1¾ per cent. on the preferred stock, all payable to holders of record October 21.

The United States Steel Corporation, regular quartely, 1¾ per cent. on the preferred stock, payable November 29, and 1¼ per cent. on the common stock, payable December 30.

The U. S. Metal & Mfg. Company, railroad supplies and old material, with main office at 165 Broadway, New York, announces the closing of its branch in Philadelphia and the reopening of its branch at Lebanon, Pa., November 1, under the management of L. Weimer Murray.

Personal

James A. Campbell, president Youngstown Sheet & Tube Company, Youngstown, Ohio, and Robert Bentley, president Ohio Iron & Steel Company, Lowellville, Ohio, recently made a tour of the Lake Superior ore regions. In referring to his tour Mr. Campbell said: "Aside from the Mesaba range, there are as many new deposits being uncovered as there are old ones being exhausted. Our company has the controlling interest in four mines in the Lake Superior region and to these we gave our particular attention. A great deal of ore is now being taken out to anticipate the closing of navigation with the coming of winter. We traveled by special car and automobile and so were able to give the country a very careful inspection."

Dr. Wilhelm Schumacher, of Berlin, expert on the briquetting of flue dust and iron ore, has arrived in this country on an inspection trip in the interest of the General Briquetting Company, 25 Broad street, New York, representing the Schumacher process in the United States. Dr. Schumacher is now in Buffalo inspecting the recent installation of his process at the works of the Lackawanna Steel Company.

J. L. Replogle was given a testimonial dinner October 19 by a large number of the leading citizens of Johnstown, Pa., in honor of his recent election to the vice-presidency of the Cambria Steel Company.

Christopher Henry Snyder, C. E., for the past 10 years Pacific coast manager for Milliken Bros., Inc., has resigned to enter professional practice as designing and consulting engineer, with offices at 251 Kearny street, San Francisco, Cal.

Charles M. Schwab, president Bethlehem Steel Corporation, returned from Europe October 25. In answer to a question from a daily newspaper reporter regarding the supposed combination of steel companies he replied that he had been approached by a certain gentleman with a view to entering a combination of the Cambria and other concerns, but had not yet given an answer, as he was still considering the matter.

Albert R. Pritchard, after three years of service, has resigned as general manager of the Lisk Mfg. Company, Ltd., Canandaigua, N. Y. The directors have adopted resolutions expressing their appreciation of his services in rehabilitating the company when it was disorganized through bankruptcy proceedings, and stating that he now leaves it at his own request, with its finances in splendid condition, its sales increased and its earning power restored. He has retired to give his entire attention to personal business at Rochester, N. Y.

Robert McGlurken, superintendent of the Hannah furnace of the Republic Iron & Steel Company, Youngstown, Ohio, has resigned to become superintendent of the blast furnaces of the Northwestern Iron Company, Mayville, Wis. His successor is M. J. Regan, who was general labor foreman of the Mahoning Valley works of the Republic Company. Mr. Regan, in turn, has been succeeded by Thomas X. Fitzgerald, former superintendent of the Tudor works of the Republic Company at East St. Louis and more recently night superintendent of the Mahoning Valley works.

John Stambaugh has resigned as president of the William Tod Company, Youngstown, Ohio, being treasurer of the Brier Hill Steel Company, which practically takes up his time. He has been succeeded by David Tod. A. H. Helander, consulting engineer and sales manager, has been made second vice-president.

Announcement is made that the Republic Iron & Steel Company has declared a quarterly dividend of 1¾ per cent. on its preferred stock, payable January 1. On February 26, 1912, the executive committee of the company decided to suspend payments of preferred stock dividends so that up to October 1 5¼ per cent. had accrued. The company is now paying up at the rate of 1 per cent. a year the preferred dividends which were passed previous to 1909. In that year the back dividends amounted to 6¾ per cent. and of this 3¾ per cent. has now been paid. The remaining 3 per cent. will be paid in installments of 1 per cent., on October 1, 1913, 1914 and 1915.

Obituary

Maunsel White

Maunsel White, the famous metallurgist, died at the home of his brother-in-law, Edwin W. Rodd, in New Orleans, La., October 22, aged 56 years. Troubled by ill health, he had given up work in the North about eight years ago. He was a native of Louisiana. His maternal grandmother was the sister of Jefferson Davis, president of the Confederate States, and he was a nephew of Chief Justice White of the United States Supreme Court. His early education was received at his father's home from private tutors. Later he entered Georgetown University, near Washington, and after some years in this institution he decided upon an engineering career, in which he was to gain such distinction, and then entered the School of Technology, Worcester, Mass. Finishing the course at this institution, he entered the workshops of the Lehigh Valley Railroad at Weatherby, Pa. Here he laid the foundation for his practical knowledge of mechanics, and then entered Stevens Institute, Hoboken, N. J., from which he was graduated in the class of 1879, of which he was valedictorian.

Immediately following graduation, Mr. White was engaged by the Bethlehem Steel Company, and in a short time became chief of the metallurgical department of that corporation, taking very high rank as an authority upon metals. He was in charge of the company's exhibit at the World's Fair at Chicago in 1893, and also at the exposition in Paris in 1900. The administration of the Paris fair presented him personally with a bronze medal of merit as a result of the exhibition of his company planned by him.

Mr. White, as representative of the Bethlehem Company, made frequent visits to Europe, and arranged the sale of quantities of armor plate to the government of Russia. In co-operation with Frederick W. Taylor, he invented the Taylor-White process of hardening tool steel. He was a life member of the American Society of Mechanical Engineers and a member of the Iron and Steel Institute (British) and the American Institute of Mining Engineers. One of his brothers, A. S. White, is president of the New Orleans Roofing & Metal Works, New Orleans.

Tribute by Frederick W. Taylor

Maunsel White, who for many years was engineer of tests and metallurgist of the Bethlehem Iron and Steel Works, stood at the very top in each of these branches. Both the chemistry of iron and steel and the other physical properties of these metals have been so thoroughly studied in the past 30 years, and crystallized, as it were, that the metallurgist and testing engineer of to-day finds it difficult to appreciate that facts which now seem elementary and commonplace—facts fundamental in the manufacture of iron and steel—lay hidden 30 years ago in the vast unknown.

In the early days of the steel industry the life of the metallurgist who was an investigator was intense and exciting. Problems were crowded on him upon which depended the very life and existence of his company, and in the solution of these problems, in wringing these secrets from nature, Maunsel White had a large, though often inconspicuous, part.

Without doubt the great range and variety of his intellectual abilities interfered with his material success. His love of literature and poetry and his marvelous memory (which enabled him to quote pages from hundreds of authors, apropos of almost any subject) led many of his friends to look upon him as a litterateur, a poetical dreamer; and yet his keen analytical powers, his absolute devotion to the scientific method, and his well-known love of the truth led the members of his profession to look upon any conclusion announced by him as almost final.

The world at large will best remember Maunsel White from the part which he took in the investigation that led up to the discovery and development of "high-speed" tools. These tools have revolutionized the machine shop practice of the world. In many cases they have doubled and trebled the output of metal-cutting machines. Throughout this investigation, which continued through several years, he showed not only that he had the de-

votion of the true scientist, which enabled him to plod along, month after month, developing methodically one fact after another, but that he possessed the rare ability to co-ordinate and group these facts so as to indicate the true conclusions and theories toward which they tended.

In general, Maunsel White has been accorded the credit which belongs to him in this discovery. Few people, however, appreciate the detailed thoroughness of his work. How many people, for example, know that practically all makers of high-speed steel have adopted for their "best brand" steel of almost the exact chemical composition recommended as the result of these experiments, at the top of Folder 20 in the book entitled "On the Art of Cutting Metals"?

The discovery of high-speed steel will assure him a position of respect among scientists. Those who knew him well, however, will remember him not only as a scientist, but as a brilliant and entertaining man, a kindly and lovable companion, and a true friend.

Tribute by H. F. J. Porter

Mr. White and I had been very closely associated ever since he entered the service of the Bethlehem Steel Company back in the early 80's, for my connections as an alumnus of Lehigh University and a member of the staff of the Bethlehem Steel Company brought me back to Bethlehem with increasing frequency and I was thrown in contact with him on every visit. He was one of the most companionable men I ever knew, and my intimate relations with him enabled me to appreciate his honesty of purpose in every business and personal dealing. His capacity for research was most remarkable. If a problem presented itself to him he never rested until he worked out its solution, no matter how involved or intricate the method to be applied might be. His Southern nature and training seemed not to have provided him with very great ambition for personal advancement, and his innate modesty hindered his becoming as well known in the world as he might have been, or as others have become who were less qualified and who performed much less valuable service. His work, however, will live in the annals of metallurgical science, and his friends will ever remember the delightful hours spent in his company, when they enjoyed the charm of his personality and came to know the depth of his knowledge along the lines not only of science and research but in all branches of literature, and especially in poetry which he loved so much and with whose gems he was so familiar as to know the best by heart.

ROBERT G. REYNOLDS, president Richmond Stove Company, Richmond, Va., died October 18. He was educated at home and in a private school in Richmond, after which he entered Randolph-Macon College, from which he was graduated. After leaving college he entered upon a successful business career with a banking house in Fredericksburg. Later he went to Richmond, and was for a time a member of the firm of H. B. Talliaferro & Co., wholesale commission merchants. In 1880, with the late W. J. Anderson, he purchased the Richmond Stove Company, and under their management this business grew to be one of the large manufacturing enterprises of the city. He was active in civic affairs throughout his long business experience in Richmond and held several prominent offices. He leaves a widow and four children.

THOMAS B. MITTEN, superintendent of the West Pittston shops of the Vulcan Iron Works, Wilkes-Barre, Pa., died October 19, aged 61 years. He had been in ill health for three months. He was born in Bradford County, Pa., and went to West Pittston 36 years ago. After employment in the service of the Lehigh Valley Coal Company, he became connected with a plant which, after passing through several hands, is now part of the Vulcan Iron Works. At the time of his death he had been superintendent of it for 15 years. He leaves a widow and one son, Louis F. Mitten, who is now traveling salesman for the Vulcan Iron Works.

CHARLES MCCRERY, in 1904 second vice-president of the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., died recently at Denver, Col., aged 44 years. He had been in ill health for a long time. In 1894 he was superintendent of the Dunbar Furnace Company, Dunbar, Pa. Later he held a similar position with the Carnegie Steel Company at Duquesne, Pa., and afterward was manager of rolling mills in Nova Scotia.

J. B. BUSS, president Reliance Machinery & Tool Works Company, St. Louis, Mo., and also a large owner of mill property, died October 20 at Jennings, a suburb of St. Louis, aged 72 years. He left an estate estimated at $1,000,000, a large portion of it being devised to religious work and organizations.

HERMAN BOECKE, for many years a rolling mill superintendent at Birmingham, Ala., but for the past year retired therefrom because of ill health, died at St. Louis, Mo., October 21, aged 56 years. He leaves two sons and two daughters.

The Inland Steel Company, which has been using about 2,000,000 gal. of fuel oil per month in its works at Indiana Harbor, Ind., is preparing plans for a gas producer plant sufficient to care for its 12-60-ton open hearth furnaces. This will necessitate a battery of from 48 to 60 producers. As it is desirable to have the producers near the furnaces and in addition to the space required for the producers proper, facilities for coal delivery and storage remain to be provided, the problem of rearrangement in a plant already crowded may become one of considerable proportions. For this company the problem of fuel is somewhat simplified by reason of the coke ovens now under construction at its works. The gas from this source will be used for the furnaces in its rivet plant and for other heating purposes.

The eleventh annual reunion of the Air Brake Veteran Employees' Association, composed of men that have been in the employ of the Westinghouse Air Brake Company at Wilmerding, Pa., for 21 years or more, was held on the evening of October 24. President George Westinghouse and other officials of the company attended. Over 150 employees were present; one of them, Christopher Horrocks, secretary of the Association, has been in the employ of Mr. Westinghouse in various capacities for over 40 years. Since the organization was organized 11 years ago, 36 members have died, while 19 have retired from the employ of the company, having reached the age of 70, when they became entitled to a pension under the system inaugurated personally by Mr. Westinghouse about four years ago.

The J. D. Smith Foundry & Machine Company, Cleveland, Ohio, reports the receipt recently of the following orders: Complete foundry equipment for the United Foundry & Machine Company, Bridgeport, Conn.; core ovens for the Allyne-Ryan Foundry Company, Cleveland; 8 core ovens and complete sand blast cleaning system for the Interstate Foundry Company, Cleveland; a trolley system and core ovens for the American Car & Ship Hardware Company, New Castle, Pa.; core ovens for the Venango Mfg. Company, Franklin, Pa.; brass furnaces for the H. P. Muller foundry, St. Louis. This company has also just received from Sweden an order for core oven equipment.

Shippers of Boston and other parts of New England are interested in the announcement of the Hamburg-American Company that it is to establish a line of large steamers between Boston and European ports. This is said to be one of the direct results of the appropriation of a large sum of money by the State of Massachusetts for the construction of docks and drydocks.

The General Supply & Equipment Company, M. S. Hare, general manager, has opened an office and warehouse at 812 Noble street, Philadelphia, Pa., where it will represent the Big Savage Fire Brick Company, Frostburg, Md., and will carry in stock a full line of fire bricks for local and nearby delivery.

The Cleveland Engineering Society, Cleveland, Ohio, has completed plans for the reception of the Engineers' Society of Western Pennsylvania, which will visit Cleveland November 2. The Cleveland Society will entertain the visitors at luncheon at the Chamber of Commerce.

Meeting of the Efficiency Society

How the Work of the Association Is Taking Definite Shape

The Efficiency Society, the association organized March 18 this year with over 700 charter members, "to encourage increases in efficiency, the ratio of result obtained to effort expended, in every activity of man and in everything he employs," and which now has over 1000 members, held a dinner and meeting in the Aldine Club, New York City, on Friday evening, October 25. A number contributed to the efficiency movement by recounting observations they had made in their own particular lines, but the meeting served largely to give further opportunity to crystallize thoughts on management as a science as distinguished from management as an art. The most important work of the society, it appears, is being performed by weekly committee meetings held at the Engineering Societies' Building, New York, on Thursdays at 4.30 in the afternoon, at which meetings the membership at large is invited.

The methods of procedure of the society seem to be fast taking definite form so that though the society is wide in its scope and is calculated to assist industries in general, its deliberations will evolve advantageous programmes of management for one industry after another as fast as it is feasible to treat of these industries. The ultimate purpose is designed, as stated, to make management strictly a science. It is believed that the society as an influential unit may bring about, for example, changes in educational systems sufficiently sweeping to start the child along the lines of work for which he is best equipped mentally, temperamentally, physically and by environment.

At the meeting mentioned it was emphasized that the society is likely to acquire a building suitable for its purposes and obtainable under advantageous conditions. Part of the work of the society is delegated to ten committees of which the list is given below. It is planned to provide for meetings in other cities besides New York, but it would appear that they will be perhaps more spontaneous than the stated meetings of other organizations where the topic of the meeting is secondary to the fact that the time of meeting is established. It is thought that if the house for the society is acquired, as will be determined by a mail vote now in progress, meeting room privileges will be available for those desiring to discuss questions at convenient times. One movement, for example, on which there will be a meeting in November, has to do with correcting an evil in the cloak and suit industry in New York City where at present there are seasonal rushes and a considerable amount of overtime work required of operatives who for other long periods are absolutely without work.

Among those who spoke at the dinner were James H. Carter, general manager National City Bank; Wilbur Fiske, general manager Hudson & Manhattan Railroad Company; Walter C. Allen, superintendent Yale & Towne Mfg. Company, Stamford, Conn., and Dr. Schuyler S. Wheeler, Crocker-Wheeler Company, Ampere, N. J.

The society holds the view that it is desirable at the outset to emphasize the single idea of efficiency rather than to deal with all of the questions that come up in each business or enterprise. In other words, each committee has to specialize on its subject so that its results will be available for every business or activity. The list of the ten so-called functional committees is as follows:

List of Functional Committees

Committee on Minimizing Controversy.—Litigation, labor troubles, failure to arbitrate, war.

Committee on Increasing Workmen's Output.—Motion studies, Taylor System, "Scientific Management."

Committee on Perfecting Office Work Methods.—Correspondence, bookkeeping, filing, recording, investigation.

Committee on Eliminating Duplication and Repetition.

Committee on Simplifying and Standardizing Trade Methods and Customs.—Elimination of special customs at variance with uniformity.

Committee to Encourage the Use of Machinery and Appliances of Higher Efficiency.

Committee on the Most Efficient Methods in Education.

Committee on Higher Efficiency in Charitable and Benevolent Work.—Elimination of duplicated work covering the same field two or three times, and reduction of cost of administration.

Committee to Increase Efficiency in Transportation and Communication, and to Encourage Uniformity of Languages, Money, Weights, Measures, Etc.

Committee to Encourage Efficiency in the Government and the Civil Service.

The officers of the society are: James G. Cannon, president; Henry R. Towne, first vice-president; Melville W. Mix, second vice-president; Theodore Hetzler, treasurer; H. F. J. Porter, secretary, 29 West Thirty-ninth street, New York City.

The Satisfactory Service of Steel Ties

F. A. Layman has contributed an article to a recent issue of the Pittsburgh Post on the use of steel ties by the Bessemer & Lake Erie Railroad as follows:

The potentialities of the steel tie appear to have been demonstrated convincingly by the experience of the Bessemer & Lake Erie in using them during a period covering eight years. The rapidly-diminishing supply of timber ties or of the sources of supply has occasioned railroad managements many a bad quarter of an hour in the past decade, in which interval, moreover, the cost has mounted by leaps and bounds; but the Bessemer management has solved the problem, apparently, and satisfactorily at that. As far back as December, 1904, 1200 Carnegie steel ties were installed on a 4-deg. curve near Claytonia in slag ballast, and they are still in track after eight years of hard service. Since then 701,590 more such ties in the aggregate were installed, some in each of the succeeding years to the close of 1911, while the installation this year will reach approximately 200,000, making about 900,000 in all, or 270 miles of track, equal to about 43 per cent. of the entire mileage of the road, and the work is to go on, all ties renewed in main tracks and important yards being replaced by them.

The main line of the Bessemer & Lake Erie extends from a connection with the Union Railroad at East Pittsburgh to Conneaut Harbor, Ohio, a distance of 142 miles, of which all but 13½ miles is double track. The principal traffic handled is coal northbound for Canadian and Great Lake points and ore southbound for this city, and this season it has been and is considerably heavier than ever before. An average of 56 coal and ore trains, four local freights and eight passenger trains pass over the line daily during the summer months, while in addition the Erie uses 20 miles of main line between Meadville Junction and Shenango for westbound freight trains, adding about ten movements per day between those points.

Between Conneaut and Albion, a distance of 16 miles, consolidation engines, weighing 391,000 lb., with 225,000 lb. on the drivers, are used, while from Albion to North Bessemer, a distance of 125 miles, the trains are handled with consolidation engines weighing 336,000 lb., with 180,000 lb. on the drivers, two locomotives being required for the regular trains over the last 91 miles of the distance last in question. The freight equipment is composed almost entirely of cars of 100,000 lb. capacity, loaded with 10 per cent. overload, so that the car-axle loads range from 34,000 to 38,000 lb. The run from Albion to North Bessemer is made in about 12 hours, so that the freights make from 20 to 30 miles per hour on the down grades. The passenger equipment is heavy, also, the average running time being about 40 miles per hour, although 60 miles between stations is not unusual, from all of which it will be deduced that the loads on the tracks are heavy and that a very severe service is demanded of them, but, according to reports of road officials, the steel tie holds up under it and is doing its work admirably.

The Carnegie steel tie is a simple, unsymmetrical I-beam section with a base considerably wider than the top, or 8 in. and 4½ in., respectively, and a hight of 5½ in., and weighs 180 lb. for the standard length of 8 ft. 6 in. About 1,500,000 of these ties are now in use—900,000 on the Bessemer and 300,000 on the Union Railroad, and because of the density of the traffic on both these roads, which is handled almost entirely in heavily-loaded cars, the service of the ties in question is regarded by railroad men here generally as very instructive.

Customs Decisions

A Machinery Decision

The Board of United States General Appraisers, in sustaining a protest raised by A. Murphy & Co., has ruled that exclusive use need not be shown to permit of classification under the tariff act of machines having a general use, notwithstanding that they may be capable of employment outside the field for which they were constructed. Certain machinery was assessed for duty at the port of New York as "manufactures of metal not specially provided for." It was alleged by the importers that it was entitled to enter at 30 per cent. under the provisions of paragraph 197 as jute manufacturing machinery, whereas the rate exacted by the customs authorities called for 45 per cent.

The testimony showed that the machinery is adapted to the manufacture of jute from the fiber and that it is of the kind commonly employed in that industry. The Government made the claim before the board that some of the machines, at least, are likewise available for flax spinning. In finding in favor of the importers, Judge Fischer says that, while it may be true that the machines may be used as charged, this fact is not of sufficient weight to deprive machines of the type usually employed and designed for the manufacture of jute from classification under the special provision for jute manufacturing machinery in the tariff law. The decision says in part:

> The provision in question does not contemplate that exclusive use must be shown to permit of classification thereunder, and it further is quite evident that the contrasting provisions are not jute manufacturing machinery and flax manufacturing machinery, but rather a classification as jute manufacturing machinery as opposed to manufactures of metal not specially provided for." We find that the goods in question have such distinguishing characteristics as permit of their classification as jute machinery and hold that they are entitled to entry as claimed at 30 per cent.

Pneumatic Hammers

George W. Sheldon & Co. have been sustained in a contention involving the classification of hammers working with air pressure and belt driven. The Government held the articles to be dutiable at 45 per cent. under paragraph 199 of the act of 1909 as "manufactures of metal." The importer claimed that they were dutiable at only 30 per cent. under paragraph 197 as "machine tools." Judge Fischer, in sustaining the protest, says that pneumatic hammers are metal-working, power-driven mechanisms and assuredly would not be out of place as part of a machine shop equipment. He says that the board regards the articles as machine tools in the accepted sense of that term. The collector is reversed with an order to reliquidate the entries on the basis of the lower duty.

Cold-Rolled Charcoal Iron

The George Nash Company was unsuccessful before the board in a protest relating to importations of strips or sheets of cold-rolled iron in the manufacture of which charcoal was used as fuel. The dimensions of the metal in question were given at 6 in. wide, ⅛ in. thick and 8 ft. long. The New York appraiser reported to the board that the above form of charcoal iron is not provided for under paragraph 120, and that it does not appear to be elsewhere provided for. Duty was assessed at 45 per cent. ad valorem under the provisions of paragraph 199 of the tariff act of 1909, as "articles composed wholly of iron, partly manufactured and not specially provided for." The only claim raised by the protest is that strips of metal produced by the cold rolling of shapes of charcoal iron are dutiable under paragraph 120. According to the decision, it was not shown that iron of the dimensions of the goods imported would be properly denominated as bars, blooms, billets, slabs or loops, while it does not appear satisfactorily that the merchandise could find proper classification under the paragraph claimed. The protest is overruled.

Cast Iron Machine Parts

The board has sustained a protest filed by Leight & Butler, dealing with the classification of cast-iron machine parts. The articles were claimed to be dutiable as machine castings at the rate of 1 cent a pound under the tariff act of 1909. All of the merchandise was returned for duty at the rate of 45 per cent. as "manufactures of metal." The merchandise consists of repair or replacement parts of textile machinery. Judge Fischer decides that the articles are properly dutiable as claimed. The collector is reversed with an order for reliquidation at the lower rate.

Safety Razor Blades

The board has sustained a protest filed by Hermann Boker & Co., dealing with the classification of safety razor blades. The collector returned the articles for duty under paragraph 152 of the tariff act of 1909, at the rate of 12c. each and 35 per cent. ad valorem. The importers contended that the duty was excessive and disproportionate to the value of the merchandise. It was claimed that the blades are dutiable properly as manufactures of metal at 45 per cent. on the value. Judge Fischer sustains the claim.

Lock Washers of Steel

The board has taken favorable action on a protest filed by the Szel Importing Company, regarding the classification of lock washers of steel. They were returned for duty at the rate of 45 per cent. ad valorem under the provision in the tariff act of 1909 for "manufactures of metal not specially provided for." It was contended by the importers that the merchandise should be admitted as "washers" with duty at ¾ of 1 cent a lb. under paragraph 162. Judge Fischer reverses the collector and orders a reliquidation on the basis of the lower duty.

Hunting Knives

The board has sustained a protest by A. Kastor & Bros., relating to hunting knives with fixed blades and decorated handles. Duty was assessed on the articles under the present law at the rate of 10c. each and 40 per cent. ad valorem, paragraph 152. It was alleged by the importers that the knives should be allowed to enter under paragraph 154 at the rate of 40 per cent. The collector is reversed accordingly.

Wire Drawers' Plates

A protest by Frank A. Tasker has been sustained. The merchandise consisted of wire drawers' plates which have been advanced in their completed state by essentially forging processes. They were assessed under the present tariff as "manufactures of metal" with duty at the rate of 45 per cent. Judge Fischer upholds the claim that they are "forgings" and as such entitled to enter at 30 per cent.

Parts of Metal Utensils

It was decided by the board that steel handles, covers and spouts intended for use in manufacturing enameled ware must stand duty at the rate of 45 per cent. under the provision in the tariff act of 1909 for "manufactures of metal." The claim by M. E. Dey & Co., for lower rates is overruled and the collector affirmed.

Second Hand Iron Pipe

The board decided that a claim filed by P. A. Bradford was without merit. The merchandise, the subject of the protest, is second hand iron pipe which was assessed for duty at 1c. a pound as "lap welded iron pipe not thinner than No. 16 wire gauge, and not less than ⅜ in. in diameter." The only claim raised by the protest was that the merchandise is old junk, and as such entitled to free entry. Judge Fischer disagrees with this view and affirms the collector.

Silico-Spiegel

The board overruled a protest filed by Frank Samuel relating to merchandise invoiced as "10 per cent. high silicon spiegeleisen." Duty was assessed at 20 per cent. ad valorem under paragraph 183, tariff act of 1909, as "metals unwrought." It was claimed that the product is dutiable properly under paragraph 118, at the same rate as that applicable to spiegeleisen. Judge Fischer says it appears that the material is a silico-spiegel rather than a spiegeleisen. He holds that it was assessed correctly.

The agency contract between the Hewes & Phillips Iron Works, builder of Corliss engines, Newark, N. J., and the John B. Perkins Company, Boston, Mass., covering the New England States, expires by limitation November 1, and thereafter such business will be handled directly by the home office.

Mechanical Engineers' Coming Meeting

The annual meeting of the American Society of Mechanical Engineers to be held in New York City December 3 to 6, will, it is announced, comprise sessions upon a greater variety of topics than have ever been arranged for a meeting. No less than 10 sessions are contemplated, with papers grouped to form symposiums upon various subjects. One whole session is to be devoted to reports of technical committees. One of the reports is an exhaustive document prepared by the Power Tests Committee. When finally revised and submitted to the society, this will supersede the earlier reports upon methods for conducting trials of pumping engines, locomotives, steam boilers and steam engines, besides taking up the testing of other apparatus, such as gas and oil engines, waterwheels and compressors, blowers and fans. The latest society report upon any of these subjects was in 1902 and the earliest in 1890, 22 yr. ago.

The general arrangement of the sessions will be substantially as follows:

On Tuesday evening, December 3, will be delivered the address of President Alex. C. Humphreys, followed by the reception to the president-elect, who will, undoubtedly be Prof. W. F. M. Goss, of the University of Illinois.

On Wednesday morning, December 4, will be the business meeting, followed by simultaneous sessions, under the direction of the gas power section and the sub-committees on machine shop practice and on textiles. On Wednesday afternoon will be considered the reports of committees, power tests, symbols, etc. On Wednesday evening a dinner is to be given to Prof. John E. Sweet, honorary member and past president, in celebration of his eightieth birthday and in recognition of his services to the engineering profession.

On Thursday morning there will be simultaneous sessions under the direction of the sub-committees on railroads, iron and steel, and cement manufacture. For Thursday afternoon are scheduled sessions on the power plant, and on hydraulic and pneumatic apparatus, including centrifugal pumps, blowers and the measurement of flow of fluids. On Thursday evening will be held the usual reunion and dance, with collation.

For Friday morning, December 6, a session of the sub-committee on administration is announced to present a review of the present state of the art of management.

Los Angeles Places Contract for Large Pipe

The Los Angeles Aqueduct Board has placed a contract with the Pelton Water Wheel Company, San Francisco and New York, for about 2000 tons of lap-welded pipe, ranging from 54 to 84 in. in diameter, which will be used as a pressure pipe under about 1000 ft. head to supply the three 15,000-hp. water wheels now being built for the aqueduct power plant by the Pelham Water Wheel Company in connection with the Los Angeles municipal electric plant. Part of the welded pipe, 80 in. in diameter, will be of entirely new design, consisting of a welded shell 80 in. inside diameter by about ¾ in. in thickness, reinforced with rolled steel bands spaced at certain intervals so as to give the pipe a strength equivalent to that of a shell 1⅜ in. in thickness. Pipe of this design can be made in diameters as great as 6 to 8 ft. and of a strength sufficient to stand a working pressure of 2000 to 3000 lb. per sq. in.

This pipe will be manufactured in Germany by the Actiengesellschaft Ferrum, of Zawodzie bei Kattowitz, for which the Pelton Water Wheel Company is agent in the United States and Canada. In connection with this pipe line there will be a number of steel and bronze expansion joints 7 ft. in diameter, also a number of 7-ft. valves, cast-steel elbows, Y-branches, etc.

The Delaware River Steel Company, Chester, Pa., is installing a new Massick & Crooke's hot blast stove. On its completion in February the capacity of the furnace will be increased to about 250 tons a day.

The Lebanon Blast Furnace Company, Lebanon, Pa., has been incorporated under Pennsylvania laws with a nominal capital of $200,000.

Record Railroad Business for August

The monthly summary of the revenues and expenses of the railroads made by the Bureau of Railway Economics from the reports filed with the Interstate Commerce Commission shows that net earnings for August of this year were larger than for any preceding August and larger than for any preceding month with the exception of October, 1909. The net operating revenue for the 220,405 miles of line included in this summary amounted to $96,402,972, which is greater by $10,927,009 than the net operating revenue for August, 1911. This is an average of $437.39 per mile of line for the month, which is greater by $43.83 than the average per mile of line for the month of August, 1911.

The net operating revenue is the gross income from which must be paid taxes, rentals, interest on bonds, appropriation for betterments, and dividends. On the average, the operation of each mile of line for each day during August produced only $1.41 more for these purposes than during August of last year. The railroads were bitterly complaining a year ago that their expenditures for taxes, labor and supplies were not leaving them enough margin with which to make needed betterments and attract the capital necessary for extensions in their track and the additions to their cars and locomotives requisite to the handling of the growing traffic of the country. It would seem, inasmuch as their expenditures are still on the up-grade, that the record breaking traffic of the present simply puts a little more cash in their pockets for immediate needs, and leaves their pressing problems still unsolved.

Carbon Steel Company's Annual Meeting

At the annual meeting of the stockholders of the Carbon Steel Company, held at the company's offices, 30 Church street, New York, on October 21, the following board of directors was elected for the ensuing year: Charles McKnight, Gilbert G. Thorne, Edward C. Hoyt, George S. Macrum, Edward F. Slayback, D. E. Corbett and Thomas Patterson. At a meeting of the board on the same date the following officers were elected: Charles McKnight, president; Gilbert G. Thorne, vice-president; George S. Macrum, second vice-president; James Thorne, treasurer, and D. E. Corbett, secretary.

Owing to increased business, the company is spending about $100,000 on its works at Pittsburgh and has already equipped one of the most modern heat treatment plants in the steel business. The increased demand for its Cunningham process axle has made necessary an increase in the capacity of its forge shops, and it is now installing a new 500-ton forging press. In its special steels, the company is developing high carbon and alloy steels for the automobile and forging trade that are meeting with such demand that additional equipment was necessary.

Regarding its financial affairs, we are informed by the officers of the company that the stockholders have authorized an issue of $2,000,000 to take care of the present bonded indebtedness and to furnish additional working capital and a sufficient number of the bonds has been underwritten to care for all present necessities.

The Pennsylvania Railroad states officially that it has contracted for more than $20,000,000 worth of freight car equipment this year. On October 26 it stated that orders had just been placed for 5000 freight cars, as additions to equipment, comprising 4000 standard box cars and 1000 automobile cars, of which 3000 box cars and the automobile cars will be built with all possible haste by the Pressed Steel Car Company; the remaining 1000 box cars will be built in the company's shops at Altoona. In June it contracted for 4875 freight cars as additions to equipment, so that altogether its orders for additional rolling stock this year call for 9875 cars. In the official announcement distinction is drawn between additions to equipment and replacements. While 9875 cars have been added to the freight car equipment, 8000 old cars have been scrapped and replaced with new ones. Thus, in all, the Pennsylvania has ordered this year approximately 18,000 freight cars.

The Youngstown Sheet & Tube Company has removed its Chicago offices from the Marquette Building to 1563 McCormick Building, 322 South Michigan avenue.

Pittsburgh and Vicinity Business Notes

Work on the erection of the new tin plate plant of the Merchant & Evans Company, in North Warwood, near Wheeling, W. Va., is being pushed rapidly. It is expected to be ready for operation about November 1. The product will be high grade bright and terne plates.

The Riter-Conley Mfg. Company, Pittsburgh, has recently received contracts for two 40-ft. span bridges at Colliers, W. Va., one seven-track, 31-ft. span at Cleveland, and one three-track, 34-ft. span at Piqua, Ohio, all for the Pennsylvania lines west of Pittsburgh; steel for the new Dock street freight pier at Philadelphia, comprising about 1000 tons; a number of transportation tanks for the Compania Minera de Penoles, Mexico; a large storage tank for the Hormiguero Central Company, Cuba; a barge and a 55,000-barrel oil tank for the Huasteca Petroleum Company in the Tampico district of Mexico; mill building, 80 ft. x 320 ft., for the Electric Carbon Company, Massena, N. Y., together with smaller buildings; extension to galvanizing plant for the Deforest Sheet & Tin Plate Company, Niles, Ohio, and an 800-ton coal storage building for the Reliance Coke Company, Denbeau, Pa.

The Forter-Miller Engineering Company, Pittsburgh, Pa., reports that it is receiving a large number of inquiries for gas producers from concerns in various parts of the country that have been using fuel oil, and will now have to use other fuel. It has repeat orders on its books for gas producers from Spang, Chalfant & Co., Inc., Pittsburgh; Libby Glass Company, Toledo, Ohio, and Charles Boldt Company, Cincinnati, Ohio. It has recently completed installations of gas producers for the Owens Bottle-Machine Company, Toledo, Ohio; Corning Glass Works, Corning, N. Y.; Brockway Machine-Bottle Company, Brockwayville, Pa., and American Glass Works, Richmond, Va.

The Dukesmith Air Brake Company & Mfg. Company of Pittsburgh, with a capital stock of $1,000,000, has taken out a charter under the laws of Delaware. The incorporators are Milton D. Hays, William H. Gib and Elmer E. Stewart. The new company is said to be considering the erection of a plant in the Pittsburgh district for the manufacture of the Dukesmith air brake.

The United States Nut Lock Company, Pittsburgh, has been organized with a capital stock of $200,000 to manufacture, sell and deal in nuts, bolts, etc.

The Wheeling Mold & Foundry Company, Wheeling, W. Va., has recently added a road machine department to its line of products. At present small limestone crushers for agricultural purposes are being turned out, but later other types of road machinery will be added, including crushers of larger sizes.

The two new hot mills being added to the Whitaker plant of the Whitaker-Glesner Company in Wheeling, W. Va., are nearly completed and will be ready about November 15, making an aggregate of 14 hot mills in this plant.

It is expected that four or six of the new 80-ton open-hearth furnaces being built by the Carnegie Steel Company at its Edgar Thomson works at Bessemer, Pa., will be ready for operation about April. The entire equipment of 14 furnaces of this size will not be finished before the summer, owing to the scarcity of labor.

The Standard Sanitary Mfg. Company, manufacturer of plumbers' supplies, Pittsburgh, has increased its capital stock from $7,500,000 to $10,000,000, making the common $6,000,000 and the preferred $4,000,000.

Samuel W. Hays' Sons, Keenan Building, Pittsburgh, have received an order for seven 6-ton electric jib cranes to be installed in the new open hearth plant of the Brier Hill Steel Company, Youngstown, Ohio.

The Westinghouse Machine Company, East Pittsburgh, Pa., has recently received an order from the Alan Wood Iron & Steel Company, Conshohocken, Pa., for one 5000-hp. turbine and from the Inland Steel Company, Indiana Harbor, Ind., for one 3000-hp. turbine.

The American Bridge Company is erecting a gantry crane runway at its works at Ambridge, Pa., to be 700 ft. long, for a 150-ton crane, with a 130-ft. span.

On application of the creditors of the Enterprise Foundry Company, Pittsburgh, the receiver, T. Coleman Ward, has been discharged. This plant has been sold to a new company, headed by T. Coleman Ward as president, and the creditors will realize about 65 per cent. of their claims. The plant is being operated to full capacity and has good orders ahead.

Crosswise Bending Test of Rail Flanges Recommended

The failure of the rail which caused the wreck on the Wabash Railroad near West Lebanon, Ind., March 7, 1912, seems to have been caused by the seaminess of the metal in the base of the rail. James E. Howard, engineer-physicist of the Bureau of Standards, in a report of his investigation issued in pamphlet form by the Interstate Commerce Commission, Washington, D. C., says: "The steel was seamy and the initial line of rupture occurred along the line of a seamy streak. Herein is exhibited a structural defect which is prevalent, to a marked degree, in many rails. It is a defect, the presence of which is well recognized and admitted. Notwithstanding these circumstances, rails are accepted under specifications and tests in which this, the most common cause of breakage, is not guarded against."

Mr. Howard mentions the fact that this seaminess of the metal can be revealed by cross-wise bending of the flanges, and such a test for structural soundness is easily made; in fact, he emphasizes he has employed such a method of examination. About 27 per cent. of the head of the rail in question was worn down and careful track inspection should have revealed this, but the seamy streak in the base, which no doubt caused its rupture, could not have been detected by inspection. As the author states, this was a defect of manufacture which current specifications and tests are not adequate to discover, though not less than 80 per cent. of broken rails reported, covering certain periods, are of the type here encountered.

Fewer mining fatalities were recorded on the Marquette range in the 12 months ended September 30 than for any similar period in the many years since approximately as large working forces have been employed. The annual report of the mine inspector shows 15 fatal accidents, the rate per thousand men being 2.83. In the previous year 32 miners lost their lives. The 1910 report cited 29 fatalities, and in 1909 there were 23. The decrease in the death rate demonstrates that the safety work of the mining companies is producing results. Twenty-one non-fatal accidents were reported in the year.

A gas burner for boilers and furnaces has recently been put on the market by W. N. Best, engineer in caloric, 11 Broadway, New York City. It is operated in a way similar to the oil burners of the same manufacturer, and can be used in place of the oil burner, as it makes a fan-shaped blaze or a long, narrow blaze as may be required to fit the same combustion chamber as is used with the oil burner. It is said to be in great demand, especially around Pittsburgh and in Southern districts, where natural gas is used.

The Iron and Steel Institute, 28 Victoria street, London, S.W., Eng., announces that the following changes have taken place on the Council consequent on the death of W. H. Bleckly, treasurer: W. Beardmore, vice-president, has been appointed treasurer, and J. M. While, member of the Council, has been elected a vice-president, to fill the vacancy thus created. Lord Airedale of Gledhow has been elected a member of the Council in lieu of Mr. While.

According to the United States Geological Survey, 21.2 tons of uranium were mined in 1911. Some of the steel makers who have attempted to use uranium in the manufacture of steel have abandoned such experiments, the claim being made that it apparently imparts about the same properties as tungsten and is very much more expensive.

The William Graver Tank Works, East Chicago, Ind., has contracted with the Wisconsin Bridge & Iron Company for a steel building, 66 x 100 ft., which is to be equipped with rolls, punches, shears and a traveling crane

New Publications

Elementary Applied Mechanics. By Arthur Morley and William Inchley, University College, Nottingham, England. Pages, 382; diagrams, 285. Published by Longmans, Green & Co., London. Price, $1.

The author's plan to write a book that would be as valuable to the person of limited mathematical attainments as to the person well prepared in this respect, has been well carried out. The earlier chapters make much out of simple graphical calculations which experience shows appeal to young engineering students. Symbols and algebraic formulæ have been replaced as much as possible by simple numerical illustrations, which perhaps is a clearer way of teaching elementary mechanics. The work includes chapters on hydraulics, pumps and various engine motions, besides the usual divisions of elementary mechanics. In the back of the book are found trigonometric tables and answers to the examples which have been given under the different chapters. In conclusion it might be said that the work is comprehensive and at the same time simply expressed.

Fire Prevention and Fire Protection. By Joseph K. Freitag, B.S., C.E. Flexible morocco, 1038 pages, 395 illustrations. Published by John Wiley & Sons, New York. Price $4, net.

The title of the book does not amply express the value of its contents. One would not apprehend that it is a handbook, except perhaps from its appearance, and that it is valuable to the owner or builder of a building as well as to the architect, contractor and underwriter.

One part discusses the development of fireproof buildings through changes in construction and appliances brought about by the devastation of many so-called fireproof constructions. Two parts are devoted to the design and construction of fire-resisting buildings. The section on fire-resisting design includes such chapters as planning, efficiency versus faulty construction, fire-resisting shutters, windows and doors, stairways, fire escapes, etc. The section on fire-resisting construction includes chapters on concrete floors and reinforced concrete wall construction, combination terra cotta and concrete floors, roofs, suspended ceilings, etc.

It is shown that the annual fire losses in the United States have reached proportions so alarming as to make this a question of the most vital importance to American people; that extensive systems of fire fighting and insurance are not the solution of the problem and that the only possible solution lies in the universal adoption of fire prevention and fire protection, as has been successfully done in Europe, embracing measures to prevent fire and to control fires independent of departmental work so as to reduce losses to a minimum.

An important part of the book deals with special structures. Here we have the usual causes, results and method of preventing fires in theaters, schools, residences, factories, garages, safes, vaults, etc. The value of auxiliary additions, such as fire alarms, extinguishers, watchmen and watch clocks, standpipes, roof nozzles, fire drills and inspection and maintenance of protective appliances, has been broadly considered in the last part of the book. Sprinkler systems, which are proving so successful in fire-resisting building construction, are shown adaptable to most all types of buildings. The book is admirable as a tool for ready reference.

Gasoline Engines: Their Operation, Use and Care. By A. Hyatt Verrill. Cloth; pages, 320. Numerous illustrations. Publisher, the Norman W. Henley Publishing Company, 182 Nassau street, New York City. Price, $1.50.

Many books have been issued treating of gas and gasoline engines, but they are usually of a highly technical character, designed for those who are familiar with constructive details and therefore are rather difficult of comprehension by the great mass of lay readers. In this work an effort is made to present a handbook for the use of those who may have occasion to operate gasoline engines, but have little or no knowledge of mechanics or engineering. With this purpose in view technical terms and names are only used where they are absolutely essential. The explanations have been made as plain as possible. The illustrations are not presented as working drawings but are mainly diagrammatic, with certain features of construction purposely exaggerated. The contents are treated under nine chapters which take up in order the types of motors, the special features of two-cycle motors, the mechanisms of four-cycle motors, the construction of motor parts, the various motor accessories, the principles of electrical ignition, exhaust devices and governors, motor troubles, etc. A glossary of alphabetically arranged technical terms assists the reader in familiarizing himself with the various parts and enables him to secure a much more thorough knowledge of the subject than would be possible without it. The book will undoubtedly be found of great practical value by the class of readers for which it is expressly intended.

Scientific American Reference Book. Compiled and edited by Albert A. Hopkins and A. Russell Bond. Size, 5½ x 8 in.; pages, 608; illustrations, 1000. Published by Munn & Co., Inc., New York. Price, $1.50 net.

A compilation of concise information is this book, in the preparation of which Mr. Hopkins gave his attention to statistics and Mr. Bond looked after the scientific side. Facts and figures concerning discovery, exploration, shipping, aeronautics, wireless telegraphy, armies and navies of the world, statistics of population, chemistry, geometric constructions and formulas, machine elements, mechanical movements, astronomy, great achievements and developments generally are accorded a place in the book, and this list by no means indicates all that is to be found between its covers.

The Modern Gasoline Automobile. By Victor W. Pagé, M. E. Cloth; pages, 724; illustrations, 500. Publisher, the Norman W. Henley Publishing Company, 132 Nassau street, New York. Price, $2.50.

The author of this monumental work is a consulting automobile engineer, formerly technical editor of the Automobile Journal. He presents an exceedingly practical treatise which deals with the design, construction, operation, maintenance and repair of gasoline automobiles. It is intended for the use of all who are affiliated with the automobile industry in any capacity, every effort having been exerted by the accomplished author to make it a compendium of the latest automobile practice. The illustrations are original, and as they are simplified and adapted from engineering drawings they are correct in detail and proportion. They show the actual mechanism used in domestic and foreign automobiles as at present designed. It is so written as to be easy of comprehension by motorists, students, salesmen, demonstrators and others without technical education, but who need a work for reference which will instruct them fully regarding a machine of such a complicated character as the automobile. The book is very thorough, a somewhat careful examination failing to disclose any point in connection with the automobile, its care and repair, to have been overlooked.

The State Engineering Experiment Station at the Pennsylvania State College, under the direction of Prof. J. A. Moyer, of the mechanical engineering department, is making an interesting investigation. With the increase in the price of gasoline has come the demand for some cheaper fuel that will give as good results. Kerosene would meet the demands if a satisfactory carbureter can be designed, and it is with a view of determining the merits and defects of various types of carbureters that the investigation is being carried on. Professor Moyer, who has made numerous experiments on smoke washing and the electrostatic treatment of smoke, has already installed at the college a motor built to utilize the energy from either of the two fuels mentioned and suitable for use on farms and country estates. Experiments will also be made on various mixtures, and a carbureter valve will be designed to shift the fuel supply automatically from a small gasoline tank, used only for starting, to the main kerosene tank.

In announcing the reorganization of the J. B. Carr Company, manufacturer of cable, shipping, crane, dredge, quarry and rafting chains, Troy, N. Y., it is stated that John H. Woodhouse, for many years practical manager of the Woodhouse Chain Works, Trenton, N. J., enters the company and assumes entire control of its affairs. His practical working knowledge of the chain business will, undoubtedly, result in increased efficiency in all departments.

The Machinery Markets

No marked changes are to be noted in the activity of the machinery trade when the situation is viewed as a whole, although in two or three centers there has been a slowing up tendency in sales possibly because of the nearness of election. The prospects are good everywhere, however, and no anxiety prevails in any quarter. Manufacturers are rushed and delivery requires just as much time as ever. In the New York market sales fell off somewhat, but there has been buying by the big electrical companies and prospects are good. Philadelphia shops have found difficulty in obtaining delivery of raw materials. The machine tool business is good and improving in New England, the wire makers of that section are rushed to capacity and deliveries are slow in wire rods. In Cleveland October's trade equalled that of September and the demand from automobile manufacturers is better. Cincinnati manufacturers are busy with orders already booked but new business has slackened. In that city labor is scarce. Trade keeps up well in Detroit with the demand strongest for single or small group of tools. Prospects are exceptionally good in Chicago, where the Illinois Central Railroad has issued a preliminary list representing an expenditure of about $18,000. Confidence prevails in the Central South, where woodworking machinery and power equipment are in particular demand. Conditions are satisfactory in the Birmingham district with the call best for coal mining and power plant equipment. In St. Louis a fair general demand continues, but there is a quieter tendency. There is marked activity in electrical machinery in Texas and conditions in that State are pleasing generally.

New York

NEW YORK, October 30, 1912.

In the last few days a part of the New York machinery trade has experienced one of the periods of slackened activity which are incidental to almost every month. Usually the quiet days come earlier in the month with a windup that raises the average of business close to normal or above. On the other hand some firms landed orders in the last week which were the cause of unusual satisfaction, and others perceived no large falling off in sales of single machine tools. The electrical industry has been a substantial contributor to the trade, reflecting its own activity. Further orders were placed in the last week by the General Electric Company, while the Crocker-Wheeler Company has been a recent purchaser and the Westinghouse Electric Mfg. Company has made inquiries. The Safety Car Heating & Lighting Company, which bought an extensive list for a new shop some months ago, has purchased a few additional tools. The prospects are in every way reassuring, and while there is much political talk there is but little anxiety over the outcome of the election. Although New York sales forces have found business a little slower the reports from factories indicate that manufacturers are as hard pressed as ever. It is still not unusual to hear that delivery dates have been moved forward again, especially by the makers of automatic machines.

A. Schrader's Son, 32 Rose street, New York, manufacturer of air gauges and valves, has purchased a plot of ground in Brooklyn, measuring approximately 100 x 200 ft., fronting on Clermont, Atlantic and Vanderbilt avenues. It is planned to erect a factory to take the place of its warehouse in Brooklyn and its present manufacturing plant which has been outgrown. Between 700 and 1000 people will be employed in the new building. The equipment plans are not available at the present time.

Peter Hauck & Co., brewers, Harrison, N. J., are reported in the market for a number of machine tools for the repair department operated in connection with its garage. Thomas Walsh is superintendent of the shop.

The Jacobs Automatic Self-Locking Burr Mfg. Company and the Middletown Lock Burr Mfg. Company, Middletown, N. Y., have been incorporated with capital stock of $50,000 and $1,000,000, respectively, and the latter company will establish a plant for the manufacture of nut locks. The officers of both companies are: President, John H. Galloway; vice-president, Morris Jacobs; secretary, Melvin J. Dunham, and treasurer, Hiland H. Blanchard. These officers, together with Emil E. Raasch, Sayer Fancher, John V. Demarest and William D. Bevin, constitute the board of directors for the first year.

The Shuttleworth Bros. Carpet Company, Amsterdam, N. Y., is having plans prepared for a new mill which it will erect next spring, in addition to the two mill extensions to its plant now under construction.

Martin & Stuart, Kensington, Pa., have been awarded the contract for the construction of a water works system to be built at Locke, N. Y.

Commissioner of Public Works Francis G. Ward is receiving bids until November 9 for installing an auxiliary water system at the J. N. Adam Memorial Hospital, Perrysburg, N. Y., including wells, pumps, pump houses, reservoirs, piping, electrical work, etc.

The Utica Heater Company, Utica, N. Y., Campbell Hodges, superintendent, has let a contract for a molding shop and shipping room addition to its plant on Lafayette street. The buildings will be 52 x 62 and 36 x 40 ft. respectively, of hollow tile construction.

The Oneida Steel Company, Oneida, N. Y., has completed plans for an addition 110 x 312 ft., one story, of concrete construction with saw-tooth roof, which it will build at its plant.

The Hedden Construction Company, 1 Madison avenue, New York City, has been awarded the general contract for the construction of the new plant of the Walden Knife Company at Walden, N. Y. The plant will be comprised of 20 one-story buildings of dimensions ranging from 43 x 85 ft. to 43 x 120 ft. A large amount of machinery will be installed.

Plans are in preparation for a cuff and collar factory to be built at Watertown, N. Y., by a company headed by C. H. Fernell, of White River Junction, Vt.

The Cataract Power & Conduit Company, Buffalo, N. Y., is building an extensive addition to its power plant and transformer station at Babcock and Hanna streets. Additional equipment will be installed.

The American Radiator Company is building a large core room addition to its Bond plant at Rano street and the Lackawanna Railroad, Buffalo.

New England

BOSTON, MASS., October 29, 1912.

The builders of machine tools and every other type of equipment find business good and constantly improving. The chief cause of worry concerns a promised market which present shop capacities will be made to care for. The wire manufacturers of New England are rushed to the limit of production, the only complaint concerning the delivery of rods.

Activity in Connecticut industrial stocks continues, the tendency of prices being upward. The American Brass Company has declared a quarterly dividend of 1½ per cent., instead of the customary 1¼ per cent., coupled with an extra ¼ per cent., which places the stock on a regular 6 per cent. basis. All corporations manufacturing metal products are prospering, and the fact is reflected in their securities.

A great many manufacturing plants in New England are making improvements of not enough importance for special mention, but in combination representing the outlay of hundreds of thousands of dollars. All of them mean purchases of some sort or other, and the influence on the demand is considerable. The improvements include a not inconsiderable buying of machinery by the small concerns.

The process of reorganizing the business of the Knox Automobile Company, Springfield, Mass., is progressing favorably, and the committee having the work in hand is confident of their success in putting the industry on a sound financial basis. The new officers, who were elected last week, are: President, W. E. Wright; vice-president, H. G. Fisk; treasurer, A. E. Smith; clerk, Charles H. Beckwith; directors, Messrs. Fisk, Wright, Beckwith and E. O. Sutton, W. H. Chase, Leominster, Mass.; M. J. Greenwood, Gardner, Mass.; Elijah C.

Johnson, Hartford, Conn.; Peter Murray and W. H. Cutler, North Wilbraham, Mass. The members of the board represent large financial interests.

Of equal interest to New England is the announcement of the acceptance of a plan for the reorganization of the United States Motors Company, which operates several important plants in New England. The belief is expressed that the embarrassments of these two large automobile concerns will work out to their ultimate financial strengthening and increased business.

The Eastern Malleable Company, the new Connecticut corporation which was mentioned in last week's issue, will consolidate the business of the Bridgeport Malleable Iron Company, Bridgeport, Conn.; the Vulcan Iron Works, New Britain, Conn.; the Naugatuck Malleable Iron Company, Naugatuck, Conn.; the Troy Malleable Iron Company, Troy, N. Y., and the Wilmington Malleable Iron Company, Wilmington, Del. The company starts with a capital of $10,000,000. Harris Whittemore, Naugatuck, is the head of the business, and headquarters will be in Naugatuck.

The Remington Oil Engine Company, Stamford, Conn., is increasing its capital stock from $100,000 to $125,000, the purpose being to pay off the indebtedness of the old company and to provide additional working capital, so that more prompt deliveries can be made. The company's business has increased a third in the year. The defects of the engine of two years ago have been remedied by the company's engineer, W. A. Clark, who has also developed an engine for operating on heavy oils. Previously the Remington engine has been operated exclusively with kerosene.

Bids are about to be received for the large additional shop building to be erected by the E. J. Manville Machine Company, Waterbury, Conn. The structure will be 40 by 200 ft., of brick, with steel truss roof, steel sash and a heavy traveling crane.

The Cornwall & Patterson Company, Bridgeport, Conn., manufacturer of piano hardware, will erect a one-story building as an addition to its works, to be 48 by 52 ft., with an ell 32 by 50 ft.

The American Brass Company, Waterbury, Conn., will erect a large office building at Meadow and Grand streets, of brick and steel, semi-fireproof construction, 68 by 231 ft., three stories and basement.

The J. D. Bergen Company, Meriden, Conn., will erect a foundry on land just purchased for the purpose.

The Connecticut Steel & Iron Company, New Haven, Conn., is operating its new plant for the manufacture of cold rolled strip steel. The company is starting with a capacity of 1200 tons per annum, while preparations are being made for other units which will increase the total production to 3000 tons.

The Mechanics Foundry & Machine Company, Fall River, Mass., will erect a machine shop building 50 by 100 ft., one story, which will replace the present shop.

Additions to general manufacturing works of New England include the following: Lyman Cordage Company, Newburyport, Mass., enlargements and improvements to increase capacity 25 per cent.; Naumkeag Cotton Company, Salem, Mass., one-story addition to weave shed to cover 50,000 sq. ft.; Yale Knitting Company, Malden, Mass., one-story building, 50 by 102 ft.; A. Willard Case Company, South Manchester, Conn., paper, large addition; M. Hemingway Silk Company, Watertown, Conn., additions consisting of main building 53 by 303 ft., three stories, one-story dye house 53 by 82 ft., boiler house 42 by 52 ft., engine room 32 by 52 ft., and several smaller structures; Ludlow Mfg. Company, Ludlow, Mass., provision made for new capital for the erection of additions; Potter and Hamden Knitting Companies, Springfield, Mass., mill to cost $115,000; Stens Mfg. Company, Ludlow, Mass., three-story factory 40 by 100 ft.; Silesia Worsted Company, North Chelmsford, Mass., three-story mill 50 by 200 ft.; J. J. Doyle & Son, Hartford, Conn., two-story factory 30 by 50 ft.; Pratt & Whitney Company, Hartford, Conn., addition to boiler house 20 by 35 ft.

The Chelmsford Foundry Company, Chelmsford, Mass., has leased the plant of the Union Foundry Company, Ayer City, Lowell, Mass., and will continue its foundry business there, the Chelmsford property having been sold. The machine shop will be transferred to the company's other works at Medford, Mass.

The Osgood Bradley Car Company, Worcester, Mass., car builder, will erect a large addition to its works, to be devoted to the manufacture of steel passenger coaches. The structure will be of steel, 150 by 280 ft., one story and 40 ft. in hight. The company has a large, entirely modern plant, which was erected new throughout only a few years ago. The business is very prosperous at the present time, and, in fact, the works have been busy ever since their occupation.

The Extensive Mfg. Company, 90 West street, New York, has purchased the business of the Simplex Mfg. Company, Thompsonville, Conn., and will manufacture the Simplex products, including combination bench filer and hacksaw, fan oscillator, safety valve, postage stamp affixer and envelope mailing machine.

Philadelphia

PHILADELPHIA, PA., October 29, 1912.

Machinery builders are experiencing considerable difficulty in obtaining deliveries of their raw materials, handicapping them to a considerable degree in deliveries of tools under order, although deliveries of standard types of equipment can be made in a number of instances from stock. The bulk of sales have been in the way of single tools, with an occasional transaction involving a small group of equipment. A moderate demand for both new and second hand boilers and engines is reported. Second hand machinery merchants report a fair volume of business covering general lines. The foundry trade is more active. Gray iron foundries report an increasing demand for machinery castings, while delayed deliveries of steel castings are becoming more pronounced.

Plans are under way for extensive alterations and additions, comprising a four-story brick adition 65 x 185 ft. to be erected at Twenty-first and Ludlow streets for J. J. Short & Brothers. W. C. Prickett is the architect. It is to be used as a garage and will be equipped with a steam heating plant, electric light and elevators.

The Electric Engine & Development Company of Philadelphia has been granted a charter under the laws of Delaware, with a capital stock of $100,000. The incorporators named are George T. Thompson, Frederick J. Seydell and A. L. Spence, all of this city.

The Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., has recently added to its steel foundry equipment two additional electric traveling cranes, which materially facilitate the handling of material in that department. Several months ago this concern was running at about 50 per cent. of capacity, while at the present time it is operating at as near maximum as it is able to do with a restricted labor supply.

The Weimer Machine Works Company, Lebanon, Pa., advises that its business has more than doubled in volume of what it was six months ago. All departments of the plant are actively engaged in the manufacture of equipment and material for blast furnaces and rolling mills. Principal orders recently have been for Weimer cinder cars.

The Royersford Foundry & Machine Company, Royersford, Pa., notes a better demand for punches and shears than it has had for several years. Recent deliveries have been made to the Rythes & Pringle Company, Carthage, N. Y., the Standard Mfg. Company, Bridgeport, Conn., and the Benjamin Iron & Steel Company, Hazleton, Pa. Business in power transmission equipment has been continuously good.

The Penn Surgical Mfg. Company has acquired properties at 1407-09 North Eighth street, on which it will erect a manufacturing plant 34 x 102 ft., three stories. Information as to equipment requirements is not available at this time.

Chicago

CHICAGO, ILL., October 29, 1912.

The prospect for continued machinery sales in this market is exceptionally good and inquiries both from adjoining territory and from the city are numerous and attractive. Sales in the past week have not been quite so heavy as in the preceding week, but a number of desirable orders are on the point of closing. The heavy buying by the railroads which has been assured for some time past is expected to materialize within the next two weeks, particularly as regards a considerable portion of the requirements of the Chicago, Milwaukee & St. Paul. The Chicago, Rock Island & Pacific, which was reported to have bought the list of tools for which prices were recently asked, purchased only one machine, and has yet to buy the remainder. The Illinois Central has issued a small list of tools for prices, the aggregate value approximating $18,000. This is preliminary to the large requirements upon which quotations will be obtained later. The building of a new technical high school in this city, construction of which is about to be started, will bring out a demand for a desirable lot of machines. For this manual training equipment it has become the

general practice to select only high grade tools, and business of this character has come to be especially desirable.

The Morden Frog & Crossing Company, Chicago Heights, Ill., is obtaining figures preparatory to the erection of a forge shop to be 100 x 100 ft., one story, of structural steel construction.

The city of Chicago, through A. F. Hussander, architect, is taking figures for the new Carter H. Harrison Technical High School. It is to be three stories.

H. G. Lange, 162 North May street, Chicago, is spending $15,000 for the improvement of a machine shop 41 x 71 ft., three stories.

The Sparta Plow Works, Sparta, Ill., F. R. Crothers & Co., proprietors, has been incorporated with a capital stock of $30,000 to manufacture and deal in agricultural implements.

The American Can Company has taken out a permit to build at Fortieth street and Stewart avenue, Chicago, a five-story brick factory, to cost $45,000.

The Big Four Railroad has let the contract for a one-story machine shop 120 x 300 ft. at Harrisburg, Ill. G. P. Smith, Cincinnati, is the chief engineer.

The American Stove Company, Harvey, Ill., is taking figures covering the erection of a one- and two-story addition to its plant.

The Calumet Foundry & Equipment Mfg. Company, Harvey, Ill., has been sold to James Pettigrew. The consideration was $37,500, of which $27,500 was in the form of a trust deed secured by a mortgage, the loan to run for three years at 5 per cent.

The Firestone Steel Foundry Company, Chicago, has filed notice of an increase in its capital stock from $10,000 to $50,000.

The Chicago, Milwaukee & St. Paul Railroad is having plans prepared for machine and blacksmith shops 60 x 150 ft. to be erected at Bensonville, Ill.

The Western Electric Company, Chicago, is having plans prepared for various large additions at its Hawthorne works, for which improvements an expenditure of $300,000 is contemplated.

Cincinnati

CINCINNATI, OHIO, October 29, 1912.

Although all manufacturers in this section are busy on orders previously obtained, there is little new business coming in and the lull is expected to last until after the national election. However, a number of local machine tool builders brought home from the National Machine Tool Builders' Convention quite a number of orders, part of which were from exporters. Both skilled and common labor is scarce, although few local plants have been handicapped to any extent on this account thus far.

The activity with the foundries is not confined to those making any particular class of castings, but is widespread, and quite a number of jobbing foundries are now as busy as the stove and agricultural implement companies have been for some time.

Second-hand machinery is holding its own, with a rather unlooked-for demand for contractors' equipment.

The Cincinnati Precision Lathe Company is contemplating an extension to its plant in Mt. Washington suburb. A few extra machine tools are already being purchased for installation in the present building.

The Stewart Iron Works Company, South Cincinnati, has nearly completed its three-story brick factory building for the manufacture of auto-trucks and will make up its machine tool list at an early date. The new factory will have 150,000 sq. ft. of floor space.

The Cincinnati Gear Company has moved its office and plant to its new factory building on Reading road, which it expects to have in full operation within the next few days.

The Yale Soap & Refining Company, Cincinnati, has moved into a new building at Winton place and will require a small lot of special equipment, including electric motors.

The Standard Foundry Company, Dayton, Ohio, will erect an addition to its plant on Bish avenue.

The Brenig Mfg. Company, Parkersburg, W. Va., will soon be in the market for machinery to equip a plant for the manufacture of outdoor furniture and other specialties.

The Standard Electric Tool Company, Cincinnati, has lately received several large orders for grinders and drills from both Germany and France.

The Ware Sand Company, Cincinnati, is erecting an elevator on the river front, for which some conveying apparatus will be required.

It is reported that the French Oil Mill Machinery Company, Piqua, Ohio, contemplates a large addition to its plant. Nothing has yet been given out as to machinery requirements.

The Pendergast Lumber Company, Pendergast, Tenn., has leased a large lumber yard at Cincinnati and intends erecting a planing mill later on, for which power and other equipment will be required.

The Yardley Screen & Weather Strip Company, Columbus, Ohio, has nearly completed an addition to its plant in that city.

The Portsmouth Steel Company, Portsmouth, Ohio, has awarded contract to the American Blower Company, Detroit, for a mechanical heating system to be installed in one of its buildings now being remodeled.

Contract has been awarded for a three-story brick addition to the plant of the John W. Brown Mfg. Company, Columbus, Ohio, manufacturer of automobile parts and other specialties.

Cleveland

CLEVELAND, OHIO, October 29, 1912.

Dealers generally report a good volume of single tool orders and a satisfactory volume of business in prospect. October as a whole has been a very good month, the volume of business being about as heavy as September. A good demand for standard machine tools in the past month has resulted in slow deliveries by some makers and buyers are urging shipments. The demand from the automobile trade has become more active. A local machinery house has taken an order amounting to about $35,000 for steam hammers from the Ford Motor Car Company, Detroit. It is stated that this company is buying a large amount of machine tool equipment in order to double the capacity of its plant. Second-hand machinery is moving fairly well. In the foundry trade a demand for gray iron and steel castings continues very good.

The Faultless Rubber Company, Ashland, Ohio, will equip a new machine shop and is in the market for eight machine tools, including lathes, drill presses and milling machines.

The Strong, Carlisle & Hammond Company, machinery and supply dealer, Cleveland, on October 24 opened a large four-story addition to its present quarters, adding about one acre to its former floor space. This addition will be devoted to mill supplies. A large display room is provided on the first floor.

The Marion Brass & Bronze Foundry Company, Marion, Ohio, owned by C. J. Rath, will move to Galion, Ohio, where a new foundry will be built. The company will make brass, bronze and aluminum and other castings.

W. H. McIntyre and P. M. Brotherhood of Manning, Maxwell & Moore, New York, were in Cleveland October 25 and during the day held a conference at the Hollenden Hotel with their various branch sales managers.

The White Company, Cleveland, builder of automobiles, has awarded contracts for a large factory building. It will be a one-story brick and steel structure about 160 x 240 ft.

The Ohio Forge Company, Cleveland, is enlarging its plant by the erection of a machine shop. This company will also expand the capacity of its forging department by the addition of a 3000-lb. forge hammer and a 1000-lb. drop hammer.

The Goodyear Tire & Rubber Company, Akron, Ohio, is having plans prepared for two large additional factory buildings, the erection of which, it is stated, will be started early next spring.

The Knight Tire & Rubber Company, Canton, Ohio, will shortly begin the erection of a large new factory addition. This company has just increased its capital stock from $331,500 to $1,500,000.

The Hall Iron Company, Cleveland, has been incorporated with a capital stock of $15,000 to manufacture structural steel, iron, wire, bronze, etc. The incorporators are: Herman Schroeder, A. J. Hall, Wm. L. Bartell, B. R. Fretter and Alexander C. MacKenzie.

A new company has just been organized in Sidney, Ohio, to manufacture radiators, fenders and other automobile parts. The company has acquired the plant formerly occupied by the Van Etten Folding Machine Company.

Alliance, Ohio, will vote at the November election on a $15,000 bond issue for a municipal lighting plant.

Bids for a 125-hp. boiler for the municipal lighting and water plant at New Breman, Ohio, will be received November 2 by E. R. Haynes, city clerk.

The village of Montpelier, Ohio, will issue $15,000 in bonds to repair and enlarge its electric light and water works plant.

The S. M. Jones Company, 600 Segur avenue, Toledo, is erecting an addition to its plant. The new building, which will be 60 x 130 ft., will be used as a forge shop. Three new steam hammers will be installed.

Detroit

DETROIT, MICH., October 29, 1912.

Business is keeping up well among local machinery dealers and a comparatively heavy trade is reported in single and small groups of tools. Inquiries under negotiation are also fairly numerous and in casting up the total of business transacted in the month, dealers find a very satisfactory volume. The call for special equipment has been somewhat less brisk, although some lines are in moderate demand. A good volume of business from the automobile industry is in sight. Second hand machinery is in good demand and requirements cover a wide range of equipment. Discoveries of oil in the eastern part of the state has caused considerable activity in development work and oil well equipment is being purchased in fair quantities. There is a decided lull in building operations.

The Board of Estimates, Detroit, has authorized the issuance of $100,000, of bonds for the construction of a garbage incineration plant. It is understood that a site will be selected and contracts let as soon as the bonds can be marketed.

The Max Strasburg Company, Detroit, has been incorporated with a capital stock of $25,000 to manufacture and deal in talking machines. The stockholders are William D. Trump, Max Strasburg and Bessie B. Strasburg.

The Detroit Range Boiler Company, Detroit, will materially enlarge its plant on Twenty-fourth street by the erection of a brick addition to cost about $20,000.

John Brennan & Co., Detroit, has been incorporated with $200,000 capital stock to manufacture and deal in tanks, boilers, etc. Frank S. Wernakan, Charles T. Kingston, William C. Klawitter and others are the incorporators.

The Cadillac Motor Car Company, Detroit, has taken out a building permit covering the construction of an addition to its plant at Cass and York avenues, to cost $29,000.

It is reported that the Chevrolet Motor Company, Detroit, has secured a site at Flint, Mich., for the erection of a body building plant. It is understood that work will be started immediately.

Caille Bros., Detroit, manufacturers of gasoline motors and coin controlled machines, have commenced the erection of a large addition to their plant.

The Sprung Carbureter & Clutch Company, Detroit, has been incorporated by Edmund Sprung, William Healy and J. S. Kennary with $45,000 capital stock. The new company will engage in the manufacture of automobile parts.

The Biad Sales Company, Detroit, has been organized with $10,000 capital stock to manufacture and deal in automobile accessories. The incorporators are W. C. Chapman, R. P. Baubie and G. A. Breeze.

The W. J. Burton Company, Detroit, has been incorporated with $100,000 capital stock to manufacture supplies incidental to the tinning, roofing and hardware trades, William J. Burton, Frederick F. Snow and Matthew H. Bishop are the principal stockholders.

The Ottawa Leather Company, Grand Haven, Michigan, states that the report that it had acquired a plant in Detroit is erroneous and that on the contrary plans are under way to enlarge its present plant 50 per cent.

The Michigan Oil, Gas & Coal Company, Saginaw, Mich. has been organized with $50,000 capital stock to develop oil lands in the Saginaw valley. The directors are A. S. Rogers, W. H. Foote and Otto Dittmer.

Nelson Bros., Saginaw, Mich., manufacturers of pump jacks and gasoline engines, have outgrown their present plant and will erect a large addition and a new warehouse. Their line of products is also being expanded.

The boiler shop and tinsmith shop of the Port Huron Engine & Threshing Company, Port Huron, Mich., were destroyed by fire October 19, entailing a loss of about $20,000. The company contemplates the immediate rebuilding of the burned portions of its plant.

J. L. Millspaugh and Frederick Dowsett, Battle Creek, Mich., will establish a large foundry plant in that city. A site has been secured and a building to cost about $25,000 will be erected.

The City Clerk of Monroe, Mich., will receive bids until November 18 for furnishing motor driven fire apparatus.

The Bancroft Coal Company, Saginaw, Mich., has been incorporated with $25,000 capital stock to mine coal and shale in Shiawassee County and also contemplates the manufacture of brick. A. E. Hamilton and William Brown are among those interested.

The Beck Mfg. Company, Milford, Mich., has been incorporated with $30,000 capital stock to manufacture wood and metal specialties and sectional book cases.

The Pontiac Industrial Company, Pontiac, Mich., has been incorporated with $50,000 capital stock to engage in the manufacture of automatic levers, motor boats and accessories.

The Havers Motor Car Company, Port Huron, Mich., has increased its capital stock from $115,000 to $175,000 to provide for increasing business. The company plans to double its output of automobiles during the coming season.

The Central South

LOUISVILLE, KY., October 29, 1912.

The machinery demand remains as strong as ever and the general situation is good. Wood-working machinery is the most active item on the special list, while power equipment is a leader in point of sales. Electrical apparatus, in the way of generators and motors, is moving freely. While there are many new projects coming to the front and requiring machinery, old manufacturing plants are being added to, so that there is evidence of confidence in every direction.

Boiler manufacturers are interested in a new lumber-curing device which is making its appearance in Southern markets. By means of subjecting lumber to steam under pressure, drying is accomplished much more rapidly than by ordinary methods. The lumber is inclosed in a retort similar to that used in creosoting operations and put under pressure. In the event that the system is shown to be thoroughly practical, it is believed that a larger field for boilers will be opened.

The Washburn-Crosby Company has installed a 125 kw., 250-volt generator in its Louisville mill. The generator is the product of the James Clark, Jr., Electric Company.

The Southern Motors Company, organized in Louisville with a capital stock of $100,000, promises to be the largest concern of the kind in the State. It will erect a large building and equip a garage and machine shop for repair purposes. Freight elevators of considerable capacity will be installed. I. A. Whitehead, heretofore with the Church-Field Motor Company, Detroit, will be the active manager of the company and will probably be in charge of machinery purchases.

The Louisville Silo & Tank Company, recently organized, will equip a shop for the manufacture of silo parts. The equipment to be purchased includes a shear, bender, automatic thread-cutter, bolt cutter, etc., while a few wood-working machines, including a sticker and a cut-off saw, will be bought. W. C. Curry is secretary of the company, which is located at Frankfort and Story avenues.

The Falls City Construction Company, Louisville, has the contract for the installation of a heating plant in the Mercer County courthouse at Harrodsburg, Ky. The same company will erect the building.

J. J. Gaffney, Louisville, will receive bids until November 24 for the erection of the St. James Hotel, which it is estimated will cost $150,000. A good deal of mechanical equipment will be required.

The Norman Lumber Company, Louisville, is buying additional power equipment for installation at its Holly Ridge, La., sawmill. Address E. B. Norman, vice-president.

The Ohio River Contract Company, Evansville, Ind., which is reconstructing the Louisville Canal, will

erect four small power-houses on the walls of the structure for the purpose of operating the gates of the locks. They will not be needed for some time, however, as the entire job will take several years for completion.

L. B. Herrington, president Richmond Electric Company, Richmond, Ky., and head of the Dix River Power Company, has announced that the latter company will let contracts in the immediate future for the construction of its water power plant on Dix River.

The Public Service Company of Clay, Ky., has purchased an electric light franchise and will begin the construction of the plant in the immediate future. An ice factory and a machine shop will probably be established in the same connection.

Berea, Ky., will vote on a bond issue of $16,000 November 5, for the purpose of providing funds for the construction of a water-works system.

The O. Flynn Tobacco & Realty Company, Glasgow, Ky., will open bids in December on the construction and equipment of its tobacco factory. A 50 hp. boiler and engine will be installed. O. Flynn is manager of the company, which has $15,000 capital stock.

The Hazard Water Company, Hazard, Ky., has been organized with $10,000 capital stock and will build a water-works system. It has already acquired a franchise. J. E. Johnson, J. L. Morrison and B. P. Wooten are stockholders.

The American Tobacco Company, Louisville Ky., will install electric power presses and other devices for the rapid handling of tobacco at its warehouses at Shelbyville, Ky.

Leslie Hite, superintendent of the municipal electric light plant at Henderson, Ky., has recommended the installation of a reserve equipment consisting of a boiler and turbine, stating that the plant is at present overloaded.

The Fannin & McCullough Sheet Mill Company, Ashland, Ky., is in the market for a 12-ft. roller corrugating machine and a 126-in. squaring shear. The company has taken over the plant of the Ashland Sheet Mill Company and will put it in operation as soon as certain improvements are made.

The Selmer Electric Light & Gin Company, Selmer, Tenn., has been incorporated with $5,000 capital stock. C. B. Steadman is president of the concern, which contemplates the establishment of a cotton gin and electric light plant.

The International Heating Company, Nashville, Tenn., is being organized by Walter M. Grubbs and others for the manufacture of a patented grate and hot air furnace.

The F. & O. Cedar Works, Nashville, Tenn., is in the market for a second-hand boiler-feed pump and a small dynamo.

Indianapolis

INDIANAPOLIS, IND., October 29, 1912.

The Martin Tractor Company is having plans prepared for a plant with a capacity of 500 cars a year in Indianapolis, to manufacture the Martin tractor, a three-wheeled power motor for heavy hauling. The one wheel in front enables it to make short turns in alleys and narrow passages. It is in a way a street locomotive, drawing wagons and drays. The company has $350,000 capital stock. The officers are: Hugh R. Richards, president; George D. Thornton, vice-president; F. B. Davenport, secretary, and Edward D. Moore, treasurer. Charles H. Martin will be general manager.

Following the dismissal of a complaint in the Superior Court at Indianapolis asking a receiver for the Bates Forge Company, a second complaint was filed and the Court appointed Frank O. VanDeren receiver. The assets are placed at $50,000 and the liabilities at $18,000, but the company needed cash in hand which it could not raise.

The Vulcalose Company, Hessville, Ind., has been incorporated with $75,000 capital stock, to manufacture rubber articles. The directors are Orrin A. Wheeler, Samuel Livingston and Frank Armstrong.

The Clifford Automobile Company, Monticello, Ind., has increased its capital stock from $15,000 to $30,000.

The Wilhelm Safety Air Hose Company, Michigan City, Ind., has been incorporated with $50,000 capital stock, to manufacture air hose couplers, etc. The directors are Oliver P. Wilhelm, Sanford W. Wilhelm and Lane W. Wilhelm.

The Imperial Desk Company, Evansville, Ind., has been incorporated, with $100,000 capital stock. The directors are Benjamin Bosse, Louis C. Greiner, Charles M. Frisse, Fred W. Bockstege and Edward W. Ploeger.

The Clay Products Company, Brazil, Ind., announces it will rebuild its plant recently destroyed by fire.

The Turner's Gas Company, Arcadia, Ind., has been incorporated with $10,000 capital stock to operate oil and gas wells. The directors are Joseph H. Hicks, Charles M. Martz and Wylie B. Turner.

The Evansville Desk Company, Evansville, Ind., will add a story to its factory building, to increase the capacity.

The Crescent Furniture Company will build an addition to its plant to cost $20,000.

The Monarch Iron Works, Plymouth, Ind., is having plans prepared for the erection of a foundry in that city.

The Fort Wayne Engineering & Mfg. Company, Fort Wayne, Ind., manufacturer of air compressors, pumping machinery and water systems, is about to build a new factory.

Birmingham

BIRMINGHAM, ALA., October 28, 1912.

Machinery dealers report a satisfactory business. The demand for all sorts of supplies for coal mines has been in evidence for some time, while sawmills and other industrial plants continue to take a fair amount of goods. The formation of a number of corporations to be engaged in industrial lines indicates considerable activity in everything pertaining to boilers, engines, machine tools, etc. Small materials are moving in considerable quantities and repair shops are reported busy. Actual transactions have been only moderate recently, but tentative business is fair to good.

A lumber plant will be established on an extensive land tract near Meigs, Ga., by W. E. Aycock, Moultrie, Ga., and L. W. Myers, Tifton, Ga.

The Brent Lumber Company, Tunnel Springs, Ala., recently incorporated, has purchased timber tracts and, it is reported, will erect mills.

Lilly, Ga., has plans for small water works prepared by J. B. McCrary Company, Atlanta, Ga.

Grantville, Ga., has awarded a contract for $10,000 lighting system to J. B. McCrary, Atlanta, Ga.

The Virginia Bridge & Iron Company was awarded a contract to build the main portion of the plant of the Lynchburg Pipe & Foundry Company at Anniston, Ala. Work on grading starts at once. W. E. McWane is president of pipe company.

The Republic Iron & Steel Company will install new washers and expend total of $100,000 in improving mines at Sayreton and Palos. Machinery will be installed.

The United Fruit Company contemplates establishing a cold storage plant in Pensacola, Fla.

A cold storage plant to be established in Tampa, Fla., by C. G. Hilderly and Crenshaw Brother and Saffold, will cost $45,000 and have 27,000 sq. ft. of cold storage space.

The Pensacola Cooperage Company, Pensacola, Fla., will increase its capacity from 350 to 500 barrels daily. A. L. Reinschmidt is manager.

John Wolfenden is reported as about to establish a crate factory at Worthington, Fla.

Plans for $20,000 water works at Bowdon, Ga., have been prepared by the J. B. McCrary Company, Atlanta.

The Douglas Ice & Fuel Company, Douglas, Ga., has been incorporated with $25,000 capital stock to manufacture ice, etc., by S. M. Roberts, S. J. Stubbs, C. R. Tidwell and others.

St. Louis

ST. LOUIS, MO., October 28, 1912.

The past week has shown something of a slackening in the machine tool trade, but the dealers credit it chiefly to the natural hesitancy developing from the near approach of the election itself and not to the political situation as a whole. Basically they feel that business will return instantly to its proper flow once the actual voting is over and the argument settled. The demand existing is general both in territory and class of machinery. Collections are very good.

The Benoist Air Craft Company, St. Louis, has increased its capital stock from $50,000 to $100,000 for the purpose of increasing the mechanical capacity of its plant for the manufacture of aeroplanes and aerodynamic testing devices.

The National Banana Carrier Exchange Company, St. Louis, has been incorporated with $24,000 capital stock for the equipment of the plant for the manufacture of a patented device for the shipment of bananas. The stockholders are Charles Devoto, Charles H. Edgecombe, M. B. Hilliard and George Bosche.

J. A. Hutchison, of St. Louis, has purchased a site and will build a factory structure fully equipped with light manufacturing machinery for sublease to tenants, particularly automobile repair shops and accessory manufacture.

The Southern Illinois Railway & Power Company has begun work on its power house, which will be located at Harrisburg. It will be of sufficient capacity to operate a line connecting the town of El Dorado, Wasson, Big Muddy, Harrisburg, Dorrisville, Tedford and Carrier Mills.

The plant of the Great Western Chemical Company, Stallings, Ill., which has the contract for the reduction of the St. Louis garbage, was damaged $3,000 by fire last week, the loss being on machinery, which will be replaced.

The Hydraulic Pressed Brick Company, St. Louis, has purchased 100 acres of clay land in the northwestern part of St. Louis and will install mechanical equipment for mining the clay.

The Hurburg-Graves grain elevator at Weston, Ill., was burned October 20 with a loss of about $50,000. The building will be rebuilt and the mechanical equipment replaced.

The Phoenix Refinery Company has begun work on its refinery at Sand Springs, Okla., which is to be equipped with machinery for the handling of 2500 barrels of oil per day, together with equipment for residue plants.

The Enterprise Crushed Rock Company, Kansas City, Mo., has been incorporated by B. W. Boxmeyer, W. E. Webster and R. L. Boxmeyer for the purpose of equipping and operating a rock crushing plant.

The Swan Machinery Company, Joplin, Mo., has been incorporated with $75,000 capital stock by W. A. Swan, C. B. Boyer and A. T. Swan and will be in the market for equipment, it is reported, in a short time.

The St. Louis Motor Transportation Company, St. Louis, with $25,000 capital stock, has been incorporated by William R. Bush, Knox Taussig, Frank J. Bush, William A. Thomas and R. S. Locke, and will proceed with plans previously reported.

The Wagner Electric Company, St. Louis, has awarded the contract for an addition 40 ft. x 350 ft. to its plant to cost $30,000.

The Mortgage Guaranty Company, St. Louis, has financed a $1,000,000 freight warehouse and terminal to be equipped with mechanical freight handling devices and to be erected in St. Louis on the north side at once.

The Brokaw-Eden Mfg. Company, St. Louis, has increased its capital stock from $30,000 to $60,000 for the purpose of increasing the mechanical equipment of its plant and extending its business.

The Ponca Refining Company, Kansas City, Mo., has been incorporated with $75,000 capital stock for the purpose of equipping an oil refinery. The stockholders are F. H. Thwing, Harry Evans, George A. Todd and others.

The Taylor Couch & Bedding Company, St. Louis, John H. Taylor manager, has plans for the equipment of a plant for the manufacture of iron couches, davenports, etc., and will also equip a mattress manufacturing plant, with carding machines, pickers, stuffers, etc.

The Kansas City Automobile Company has plans for the construction of four-story repair shop and garage to cost about $40,000 with mechanical equipment.

The Taylor Automatic Air Controlling Company, Muskogee, Okla., has been organized with $25,000 capital stock by Nick and T. M. Taylor and George Updegraff to equip a plant for the manufacture of a patented device.

An automobile repair plant, with garaging facilities, will be equipped at Kansas City, Mo., with machinery at a cost of about $20,000 by George E. Bowling & Son, now in the Gordon & Koppel Building.

The freight facilities of the Union Pacific at Kansas City, Mo., are to be improved at a cost of $100,000, including the installation of considerable automatic mechanical devices.

A waterworks plant at Booneville, Ark., is planned by the municipality, the size and character being as yet undetermined. The matter is in the hands of the mayor at present.

The waterworks of the city of Greenwood, Miss., are to be increased in capacity by the addition of a pumping engine of 3,000,000 gal. daily capacity.

The Eagle Furniture Company, Blytheville, Ark., with $10,000 capital stock, has been incorporated by C. E. Brown, J. T. Newberry and A. J. Doris and will equip a manufacturing plant at once.

The Sarber Oil Company, of Parkersburg, W. Va., represented by O. S. Sarber, has purchased the rights on oil lands near Springfield, Mo., and has announced its intention of expending about $35,000 on machinery and development work.

The Joplin Ice & Cold Storage Company, Joplin, Mo., will double the capacity of its plant, now 75 tons per day, by the construction of buildings and the addition of mechanical equipment to cost about $100,000.

The Wainwright Gas & Power Company, Wainwright, Okla., has been incorporated with $25,000 capital stock by W. T., J. S. and M. P. Amis, of Muskogee, Okla., and J. R. Harris of Fayetteville, Ark., and will equip and develop property owned by the stockholders.

The Haskell Oil Company, with $100,000 capital stock, has been incorporated by C. N. Haskell, A. T. Wood and E. C. Y'Arnett of Muskogee, Okla., and will equip and develop 1000 acres of oil lands controlled in the Glen Pool district.

The Cushing Gas Company, Cushing, Okla., with $50,000 capital stock, will equip and develop lands owned by John Devereux of Guthrie, Okla.; B. B. Jones of Bristow, Okla., and C. J. Wrightman of Tulsa, Okla.

The plans of the Bienvenu Lumber & Mfg. Company, Baton Rouge, La., recently reported organized, will include the construction and equipment of mills to cost $50,000, with a daily capacity of 50,000 ft.

The Chickasaw Cooperage Company, Memphis, Tenn., is constructing a plant at Binghamton, near Memphis, to have a capacity of about 20,000,000 staves and 1,000,000 heads annually.

Additional coal lands have been purchased by the Folsom-Morriss Coal Mining Company of Midway, Okla., with post office at Lehigh, Okla., and will install equipment for its development.

A machine shop, of capacity not yet determined, will be built and equipped at Harrisburg, Ark., by W. L. Brown and others.

The Memphis Sash & Door Company, Memphis, Tenn., will install machinery in the plant of the Rockwell Screen Door Company, Malvern, Ark., which it has purchased, and will manufacture sashes, doors and screens there.

George F. Weis of Wheetley, Ark., will rebuild and re-equip his spoke manufacturing plant recently burned and all the machinery destroyed, with a loss of $6,000.

The Hughes Stone Company, Tulsa, Okla., will increase the capacity of its plant and mechanical plant and will also install lime burning equipment.

The State Charity Hospital, Jackson, Miss., has plans for the installation of a deep well pump driven by electric motor.

Bids will be received until November 11 at Magnolia, Ark., for the construction of a waterworks system with all machinery, etc., under plans prepared by H. W. Wright, engineer, of Winnfield, La.

Texas

AUSTIN, TEXAS, October 26, 1912.

The most prominent feature of the machinery trade in Texas at this time is the marked activity in electrical development. This embraces the installation of new electric light and power plants, the enlargement of existing enterprises of this charcater and the construction and projection of a number of new interurban electric railways as well as the extension and improvement of city street railway systems. An invasion of Texas is being made by three large groups of electrical investing interests and there is much competition apparent between them in the matter of acquiring plants and franchises in different parts of the State. In all respects the machinery trade is in a satisfactory condition with prospects of continued activity during the remaining months of the year and the early part of next year for that matter. Millions of dollars of money derived from the sale of the cotton crop are now in circulation and the effect of this prosperity is shown in all lines of trade and business.

The Port Arthur Light & Power Company, Port Arthur, recently organized with a capital stock of $600,000, has taken over the property of the Port Arthur Traction Company. It is the purpose of the company to construct an extensive system of interurban electric railways and install electric power stations. The incorporators are Edwin J. Emerson, Beaumont; Walter N. Monroe, Port Arthur; Charles W. Kellogg, Jr., Dallas.

N. W. Halsey & Co., of New York City, have acquired the properties of the Abilene Light & Water Company, the Abilene Gas, Light, Fuel & Power Company and the Abilene Ice Company of Abilene. It is announced by the new owners that these various concerns will be consolidated and operated under one management and that about $100,000 will be immediately expended in enlargements and other improvements.

The Taylor Grain & Hay Company will erect a grain

elevator at Corpus Christi, which will have a capacity of about 8000 bushels.

The Corpus Christi Ice & Electric Company will double the capacity of its electric light and power plant and will also install additional machinery in its ice plant at Corpus Christi.

J. C. McDowell, of Pittsburgh, Pa., and associates will soon finish the erection at Donna, Texas, of a new sugar mill which will have cost about $400,000.

The Texas Light & Power Company has purchased a site of 10 acres at Waco on which it will erect a large central electric power plant at a cost of about $600,000. This plant will furnish the power for operating the interurban line of the Southern Traction Company.

The Miami Copper Company is preparing to enlarge its ore concentrating plant at Miami, Ariz.

The Bessemer Gas Engine Company, Dallas, has been organized with a capital stock of $10,000. R. J. Torrance, of Dallas, is interested.

The Waxahachie Planing Mill Company will install a planing mill at Waxahachie. Edward Plumhull is interested.

The plant of the Texas-Mexican Electric Light & Power Company at Eagle Pass has been purchased by J. F. Strickland, of Dallas, and associates. It is planned by the new owners to construct a system of electric railways in Eagle Pass and Piedras Negras, situated in Mexico just across the Rio Grande from Eagle Pass, and to extend the lighting system in both cities.

The Humble Machine Works, Galveston, the plant of which was recently destroyed by fire, is occupying temporary quarters pending the erection of a new plant on the site of the old.

The Gulf, Colorado & Santa Fé Railroad, F. Merritt, chief engineer, Galveston, will erect a machine shop, power house and roundhouse at Brownsville.

The Cummer Mfg. Company has increased its capital stock to $80,000 from $40,000, and will enlarge its crate manufacturing plant at Paris, Texas.

The Atchison Topeka & Santa Fé Railroad has plans under way for the erection of extensive division shops at Albuquerque, N. Mex., upon which an expenditure of $1,600,000 is contemplated.

Canada

WINNIPEG, MAN., October 25, 1912.

There is a lull in the demand for machinery, but there are some good prospects. The local houses are filling contracts made recently, and a few complaints are heard regarding delays in shipments. The movement of waterworks machinery and equipment is still fairly large. Only recently several towns have decided to begin installing waterworks systems. The outlook for the lumbering industry in western Canada, especially British Columbia, is very favorable, and several companies are expected to increase their plants in the coming season. Owing to the very large number of big warehouses and office buildings erected in western Canada this year there is a heavy demand for passenger and freight elevators. The general industrial outlook in this part of the Dominion continues very promising.

The Raw Hide Leather Goods Company, Winnipeg, is planning to erect a tannery here. The manager is T. E. Woodcock.

The Alberta Rolling Mills, Medicine Hat, Alberta, at its recent annual meeting, decided to increase the capital stock from $150,000 to $500,000, and extended its operations. It is the intention to place in the mills open hearth furnaces which will be used for the manufacture of steel ingots.

The Cowichan Lake Lumber Company, Cowichan Lake, B. C., is planning to erect a sawmill there in the near future.

Cushings Bros., Ltd., Calgary, Alberta, are figuring upon erecting a branch sash and door factory at Lethbridge.

Tenders are being received by J. B. Cote, clerk of the city of St. Boniface, Man., for a variable speed motor driven pump of 1,500,000 gal. capacity, 550 volt, two phase alternating.

The city of Port Arthur, western Ontario, is planning waterworks extensions at a cost of about $520,000. The consulting engineer is T. Aird Murray, Lumsden Building, Toronto, and the city engineer L. M. Jones.

The ratepayers of Revelstoke, B. C., will vote on a by-law to spend $10,000 on waterworks.

The town of Edmonds, B. C., will extend its waterworks at a cost of about $40,000. The general contractor is T. R. Nixon, Vancouver, B. C.

The Smart Bag Company, Ltd., Winnipeg, has purchased the necessary land to increase the capacity of its plant.

The Stewart Sheaf Loader Company, Winnipeg, has taken out a permit for the erection of a woodworking shop.

The Vulcan Iron Works, Winnipeg, recently mentioned as having an addition in course of erection, will be in the market about January 1 for its equipment, which includes radial drills, pulley lathes, angle shears, gate shears, etc.

The E. T. Wright Shoe Company, St. Thomas, Ont., Ernest E. Donovan, manager, will erect and equip a factory building 45 x 120 ft., four stories and basement, to cost about $45,000.

The Windsor Power Building Company, Ltd., Windsor, Ont., will erect a factory and industrial power building 71 x 271 ft., three stories and basement, to cost with equipment $100,000.

The Leggett & Platt Steel Bed Company, Carthage, Mo., will build a Canadian branch plant at Windsor, Ont. Plans have been prepared for two factory buildings, each 50x100 ft., one story.

The Minaki Boat & Supply Company, Ltd., Minaki, Ont., has been incorporated by John H. Parkhill, Henry P. Blackwood and Vivian V. McMeans and will establish a factory for the manufacture of motor boats, engines and machinery.

The Geo. White Company, London, Ont., has completed plans for an extensive enlargement of its plant. Arthur W. White is manager.

R. E. Eckert and George Turdell, 434 Queens avenue, London, Ont., have acquired the plant of the Wilcox Mfg. Company at Chelsea Green. They will remodel and equip it for the manufacture of hardware specialties. Some special machinery, shafting and fittings, heating and electric lighting equipment will be required.

The Hamilton Iron & Steel Company has plans in preparation for an extensive addition to its plant at Point Edward, Ont.

The Durham Duplex Razor Company, Ltd., Toronto, has been incorporated with a capital stock of $40,00 by William E. Albus, George P. McHugh and William H. Furlong. Preliminary plans for a factory are under way.

The Auto Top & Buggy Company, Ltd., Toronto, has been incorporated with a capital stock of $200,000. A manufacturing plant will be arranged for. James E. Day, John M. Ferguson and Edward V. O'Sullivan are provisional directors.

A. J. Stough, St. Thomas, Ont., manufacturer of steel vaults, etc., will erect and equip a new factory 60 x 150 ft., two stories, of brick and concrete. Steel riveting machines and blacksmithing equipment will be required; also steam heating, electric light and motor equipment.

The Gray Mfg. & Machine Company, Ltd., Toronto, has been incorporated with a capital stock of $24,000 to manufacture engines, machinery, mill supplies and steel, and Alexander Gray, Port Credit, Ont., and James, L. S., Robert and M. F. Gray, Toronto, are the incorporators. A manufacturing plant is being arranged for.

Government Purchases

WASHINGTON, D. C., October 28, 1912.

The Bureau of Yards and Docks, Navy Department, Washington, will open bids November 2 for one 15-ton locomotive crane to be delivered to the naval station, Pearl Harbor, Hawaii.

The Isthmian Canal Commission, Washington, under canal circular 741, is asking for bids to be opened November 14 for a tubular boiler and a quantity of miscellaneous supplies, including twist drills, wire rope, chain, pipe, etc.

The Treasury Department, office of the supervising architect, Washington, will open bids November 25, for new engines, generators, etc., in the United States post office, court house, Chicago, Ill.

The commissioners of the District of Columbia, Washington, opened bids October 23 for furnishing two internal combustion oil engines, four cylinder type, for use in the water department as follows:

Foos Gas Engine Company, New York, $2830; Covington Machine Company, New York, $4,000; National Electrical Supply Company, Washington, D. C., $6355; Fairbanks, Morse & Co., New York, $3100; De La Vergne Machine Company, New York, $4198 and $4960.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids October 22 as follows:

Schedule 4860, class 41, for one motor-driven single stroke surface grinder.—Bidder 50, Kemp Machinery Company, Baltimore, Md., $2360 and $2546; 59, Manning, Maxwell & Moore, New York, $838.50; 65, National Contracting Company, New York, $850.